INSECTS OF MICRONESIA
Diptera : Tipulidae

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INTRODUCTION

The present survey of the crane flies, Tipulidae, of the Micronesian Islands results from the work of many entomologists and other interested persons. The major effort and successful culmination of the survey is due to Dr. J. Linsley Gressitt and some others, as has been detailed in the Introduction to the series of volumes prepared by Gressitt (1954; Consult bibliography at conclusion of report). This remarkably well prepared and helpful volume should be consulted by all workers on, and students of, the entomology of Micronesia.

The earliest collections of these flies available to me were those taken by David T. Fullaway in Guam in 1911 (Alexander, 1915). Three species there were described as new, these being considered in this report as *Limonia* (*Dicranomyia*) *fullawayi*, *Limonia* (*Goniodineura*) *nesopicta*, and *Trentepohlia* (*Mongoma*) *guamensis*. A larger series became available through the collections of Professor Teiso Esaki and colleagues in the Japanese Mandated islands 1936–1940, chiefly in the Mariana and Caroline islands, particularly in Rota, Kusaie, and Ponape (Alexander, 1940; Tokunaga, 1940). These latter papers included more than 20 species, of which a dozen were described as new and provided the first indication of the relative size of the family in these islands. In 1936 Otto H. Swezey and Edwin H. Bryan, Jr., collected in Guam and added a few further species (Alexander, 1942).

The sources of the materials that have since become available have been discussed in detail by Gressitt in the Introduction to the Insects of Micronesia, above cited. As concerns the Tipulidae, the collectors of these more recent materials are listed herewith, the more important names being preceded by an asterisk (*). The years when the collections were made and the more important islands concerned are listed. More detailed itineraries are provided by Gressitt (1954: 195–199).

Marston Bates, 1953—Carolines

* John W. Beardsley, 1952–1954—Palaus, Marshalls
George E. Bohart, 1945—Marianas
Edwin H. Bryan, Jr., 1936—Marianas
Charles F. Clagg, 1956—Marianas
* J.F. Gates Clarke, 1953—Carolines, Marshalls
* Henry S. Dybas, 1944–1945, 1947–1948—Marianas, Palaus, Carolines
S. Allen Edgar, 1944, 1945—Marianas
J. W. Enke, 1942—Gilberts
* Teiso Esaki, 1936–1938—Marianas, Palaus, Carolines
Y. Kondo, 1952—Carolines
David T. Fullaway, 1911—Marianas
* J. Linsley Gressitt, 1945, 1952, 1953, 1958—Palaus, Carolines, Marshalls
Ellsworth Hagen, 1944—Marianas
P. H. Hathaway, 1952—Marshalls
* Noel L. H. Krauss, 1946, 1947, 1952, 1957—Palaus, Carolines, Gilberts
Ira La Rivers, 1950—Marshalls
Shiro Murakami, 1938—Palaus
W. A. Neiring, 1954—Carolines
Zenyemon Ono, 1936—Carolines
Yoshio Oshiro, 1951—Marshalls
R. P. Owen, 1949—Carolines
* Curtis W. Sabrosky, 1957—Palaus, Carolines
* Fred M. Snyder, 1958—Bonins
John R. Stuntz, 1945—Marianas
Otto H. Swezey, 1924, 1936—Marianas
Robert L. Usinger, 1936—Marianas
Keizo Yasumatsu, 1940—Carolines
Seiichiro Yoshimura, 1940—Carolines

ZOOGEOGRAPHY

The crane fly fauna of Micronesia as now known includes only about 70 species, distributed in nine genera and representing only three of the major groups in the family. The vast subfamily Tipulinae, including the larger heavy-bodied species, has a single genus and species now known in Micronesia, being restricted to the Palaus. Elsewhere in Asia many species of this genus, *Holorusia*, occur and also a great representation of the genus *Tipula*, including many in Formosa, the Philippines, Indonesia, Wallacea, and New Guinea but with no species in Micronesia. The even larger subfamily Limoniinae has five tribes of which only two, the Limoniini and Eriopterini, have re-

presentatives in these islands. The lack of species in the Hexatomini is worthy of special note.

The largest single tribe, the Limoniini, has only two genera, *Orimarga* and *Limonia*, but the latter with 49 species has some 70% of the total number of crane flies presently known from Micronesia. In the other tribe, the Eriopterini, the largest genera are *Gonomyia* (6 species) and *Trentepohlia* (5), *Cheilotrichia* and *Styringomyia* with 2 each, while *Conosia* and *Erioptera* are known from single species only. Within the vast expanse of Micronesia there is a marked concentration of species in the more western island groups, with progressively fewer species to the east. Many of the Limoniine crane flies are delicate and light-bodied and are more readily transported by the wind which seems to account for their concentration on the islands not far removed from the major land centers to the west and south, as southern Japan, Formosa, the Philippines, Indonesia, New Guinea, and Melanesia. It may be noted that, as presently known, there are some 3000 species of Tipulidae in the Oriental region and more than 2000 in the Australasian (Australia about 700, New Zealand about 550, New Guinea 450). As is discussed later, the immature stages of *Styringomyia* and probably of certain of the other regional species in other genera occur in decaying vegetable matter and comparable habitats and such species presumably have been transported in part through the agency of man. Although little is known concerning the biology and habits of Micronesian crane flies, a few such observations are available and are discussed under the accounts of *Limonia* (*Idioglochina*), *Conosia*, *Styringomyia*, and *Trentepohlia*.

The general distribution of the Micronesian Tipulidae is shown on the accompanying table.

The specimens upon which this paper is based are included in the following collections:

Bishop Museum, Honolulu (BISHOP)
Field Museum of Natural History, Chicago FM (CM)
Kyushu University, Fukuoka (KU)
United States National Museum of Natural History (US)
Alexander Collection, Amherst, Mass. (ALEX)

The records of distribution for each species are arranged geographically from north to south, from the Bonins to the Marianas, thence west to east from the Palaus in the western Carolines to the Marshall and Gilbert Islands in the east.

Table 1. Distribution List of Micronesian Tipulidae

	Micronesian Island Groups										Other Localities
			Caroline								
	Bonin	S. Mariana	Palau	Yap	Atolls	Truk	Ponape	Kusaie	Marshall	Gilbert	
Tipulinae											
1. Holorusia palauensis			×								
Limoniinae											
Limoniini											
2. Limonia boniniana*	×										
3. L. pectinunguis		×	×		×			×	×		
4. L. pontophila		×	×					×			
5. L. fullawayi		×	×	×		×	×				Fiji; New Britain; Australia
5.a L. f. phaeoptera*								×			
6. L. guamicola		×									
7. L. guttula		×	×	×		×	×				Africa; Ceylon; New Guinea
8. L. leptomera*							×				
9. L. basifusca	×										Japan
10. L. illingworthi						×	×	×	×	×	Fiji
11. L. sordida		×	×	×							India; Formosa
12. L. swezeyana		×									
13. L. boninensis*	×										
14. L. saltens			×								India; Formosa; Sumatra; Java
15. L. aeruginosa*			×								
16. L. dybasi*			×	×							
17. L. palauensis*			×								
18. L. snyderi*	×										
18.a L. s. chichiensis*	×										
19. L. delicatior							×				
20. L. nesopicta		×									
21. L. phaeonota								×			
22. L. phaeozoma*			×								
23. L. pictoides*					×		×				
24. L. kotoshoensis							×				Formosa
25. L. obesula		×									New Hebrides
26. L. tusitala							×	×			Samoa
26.a L. t. palauicola*			×								
27. L. kusaiensis							×	×			
28. L. majorina*			×								
29. L. notata notata			×	×	×						Sumatra
29.a L. n. solomonis			×			×	×	×			Solomons
30. L. sabroskyi*			×								
31. L. strigivena		×	×			×					New Guinea

Table 1 (continued)

	Micronesian Island Groups										Other Localities
			Caroline								
	Bonin	S. Mariana	Palau	Yap	Atolls	Truk	Ponape	Kusaie	Marshall	Gilbert	
32. L. trukensis*						×					
33. L. elephantella*						×					
34. L. elephantina							×				
35. L. yapicola*			×	×							
36. L. beardsleyi*									×		
37. L. edgari*		×									
38. L. jocularis		×				×	×	×	×		
39. L. sentifera*									×		
40. L. cinereicapella			×	×				×			
41. L. biprotensa*			×								
42. L. bidentoides*			×								
43. L. ponapensis			×				×				
44. L. arachnophila			×	×	×						Luzon
45. L. carolinensis			×					×			
46. L. decussata*					×						
47. L. ponapicola*							×				
48. L. tetrachaeta*			×								
49. L. tinianensis*		×									
50. L. unisetosa perelongata*	×										
51. Orimarga palauiana			×								
52. O. perextensa*			×								
Eriopterini											
53. Conosia insularis			×	×			×				Fiji; samoa
54. Cheilotrichia palauensis*			×			×					
55. C. clarkeana*								×			
56. Erioptera geniculata			×	×							Borneo; Mindanao
57. Styringomyia didyma		×	×	×		×		×	×	×	Hawaii
58. S. sabroskyi*			×								
59. Gonomyia esakiella							×				
60. G. gressittiana*				×							
61. G. intrepida								×			
62. G. pietatis		×	×	×			×	×	×	×	
63. G. secreta			×	×							India; Ceylon; Luzon
64. G. yapensis*			×	×							
65. Trentepohlia australasiae			×								Australia; Solomon
66. T. dybasiana*			×								
67. T. guamensis		×	×	×		×	×	×	×		
68. T. poliocephala			×	×		×	×				Luzon; Australia
69. T. saipanensis*		×									

*Described as new.

COLLECTING METHODS

Adult crane flies most commonly are collected by sweeping low vegetation by means of an insect net, as along the margins of streams or ponds, or in comparable moist or wet locations.

Much of the materials discussed herewith was taken at light, in recent years by the further use of an illuminated vertical screen. Under favorable conditions, light collecting may produce extraordinary numbers of specimens of insects in many orders. As an example, the following quotation from Clarke (1971) is cited, based on collections made by him on the island of Rapa in the South Pacific in 1963. "Despite the poor weather and low temperatures the populations of some of the insects are enormous. During the month of September (1963) the Tipulidae occurred in such hordes that it was impossible to collect anything else at light because the sheet was literally covered with a plethora of flies." As concerns light collecting, in the Tipulidae a limiting factor is the vast preponderance of female specimens so attracted, in some groups virtually being restricted to this sex. In most genera of crane flies and many other insects the female sex has only limited value in classification and the male hypopygial structure is of paramount importance. In more recent years the use of various types of Malaise traps has proved to be very productive.

Key to the Subfamilies and Tribes

1. Terminal segment of maxillary palpus elongate, whip-lash-like; nasus distinct; antennae 12-segmented (fig. 1); wings (fig. 2) with vein Sc_1 atrophied; vein R_2 obliterated by the fusion of veins R_1 and R_{2+3} to form an element R_{1+2+3}; vein Cu_1 strongly shirred at *m-cu;* cell *2nd A* broad, its base some distance before the arculus; claws of male bidentate, outer tooth obtuse, base of last tarsal segment with a setiferous enlargement (epicondyle). (*Holorusia*)..**Tipulinae**

   Terminal segment of maxillary palpus short; nasus lacking; antennae with either 14 or 16 segments, if fewer than this the first flagellar segment enlarged and evidently comprised of a fusion of two or more segments (so-called fusion segment); wings (fig. 5) with vein Sc_1 present, vein R_2 present or lacking; vein Cu_1 not shirred, cell *2nd A* not conspicuously broadened; claws simple or toothed, in the latter case with the outermost denticle largest, acute, in cases with several smaller and more basal teeth; epicondyle lacking in local species.............................**Limoniinae** 2

2. Wings (fig. 5, 117) with *Rs* two-branched..3

   Wings (fig. 111–116) with *Rs* three-branched; (antennae 16-segmented, except when a fusion-segment is present)..**Eriopterini** (in part)

3. Wings (fig. 5) with vein R_2 present; antennae with either 14 or 16 segments...**Limoniini**

   Wings (fig. 117, 118) with vein R_2 lacking; antennae with 16 segments...**Eriopterini** (in part)

Subfamily TIPULINAE

As stated under the preceding section on zoogeography, the vast subfamily Tipulinae with some thousands of included species throughout the world is represented by the single genus *Holorusia,* with one species known from Micronesia to this date.

Genus **Holorusia** Loew

Holorusia Loew, 1863, Berlin. Ent. Zeitschr. **7:** 277 (type: *Holorusia rubiginosa* Loew; Nearctic).

Ctenacroscelis Enderlein, 1912, Zool. Jahrb. Syst. **32:** 1–2 (type: *Ctenacroscelis dohrnianus* Enderlein; Oriental).

Characters as given in detail by Vane-Wright (1967). Nasus present or absent. Antennae (fig. 1) 12- to 14-segmented, all flagellar segments normally with short verticils, in several species these extremely short; flagellum subserrate to nearly filiform. Wings (fig. 2) with cell *1st* M_2 always present, veins R_3 and R_{4+5} curved toward one another, constricting cell R_3 at near midlength; *Rs* commonly subequal to *m-cu;* axillary area well developed, extended proximad to well beyond the arculus, squama bare. Legs with femur bearing a terminal dorsal comb or ctenidium, comprised of thickened, regularly arranged blackened toothlike spines (spinoid setae). Male hypopygium with tergite (fig. 4) commonly shallowly to more deeply emarginate, posteriorly above with abundant long delicate setae; two dististyles (fig. 3) of characteristic shape in the various species. Details of the ninth sternite and the phallosome are discussed in detail by Vane-Wright (l.c.). Ovipositor with cerci strongly sclerotized, elongate, narrowed outwardly, tips obtuse; hypovalvae shorter. Size very large, including the largest known Tipulidae, some species having a wing expanse that exceeds 10 cm.

Holorusia is an extensive genus, presently including nearly 100 described species, almost entirely Old World in distribution, occurring in the Ethiopian, Oriental, Australasian, and southern parts of the eastern Palaearctic regions. There is a single species in the New World, the genotype, *rubiginosa,* in western North America, found from Alaska southward into northern Mexico. Six species are known from New Guinea and three from Fiji. From Indonesia and Malaya, Vane-Wright records 17 species.

1. Holorusia palauensis (Alexander) (fig. 1–4)

Ctenacroscelis palauensis Alexander, 1940, Annot. Zool. Japon., **19:** 199–200, fig. 1 (venation), fig. 13 (male hypopygium).

Holorusia palauensis: Vane-Wright, 1967, J. Nat. Hist., **1**(4): 537.

Male: Length about 17 mm.; wing 19 mm.; antenna about 3 mm.

Belongs to the *umbrina* group; mesonotal praescutum obscure yellow, patterned with brown, including four light brown stripes that are narrowly and poorly bordered by darker brown; a conspicuous brownish black lateral area behind the pseudosutural foveae; mediotergite buffy gray with a narrow brown central vitta; pleura buffy yellow, restrictedly patterned with pale brown.

Antennae (fig. 1) 12-segmented; scape and pedicel pale brown above, lower surface brighter; flagellar segments simple, lower face scarcely produced, all segments excepting the

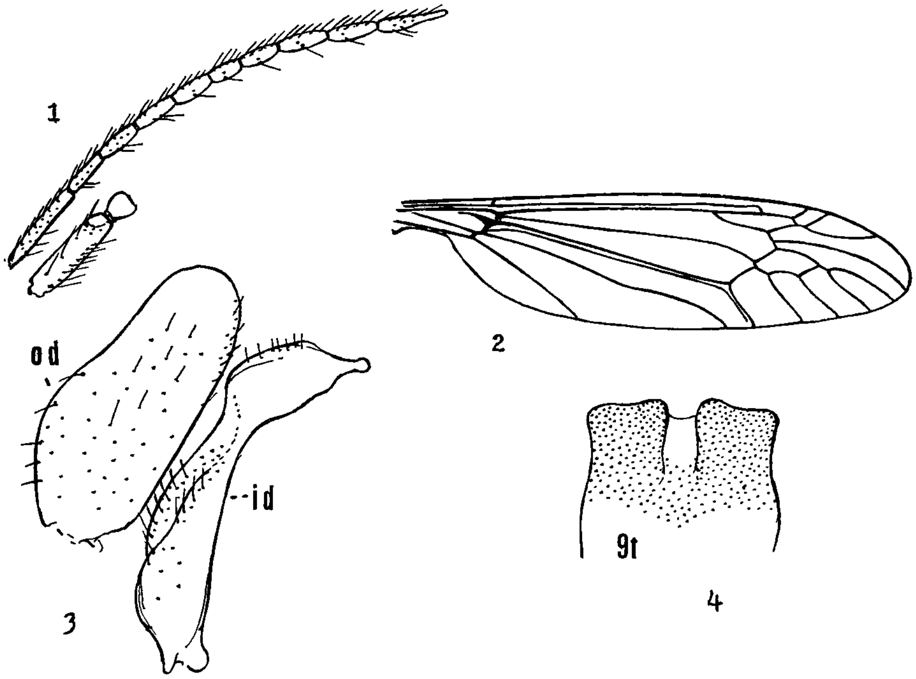

FIGURE 1–4. *Holorusia palauensis* (Alexander). **1.** Antenna, male; **2.** Venation; **3, 4,** male hypopygium. (Symbols: *id,* inner diststyle; *od,* outer diststyle; *t,* ninth tergite).

pedicel with conspicuous setae; terminal flagellar segment about one-half longer than the penultimate, narrowed outwardly. Legs with femora brown, apices dark brown, preceded by a clearer yellow ring; claws of male elongate, only slightly curved, with an obtuse tooth at near midlength and a more acute one near base. Wings (fig. 2) brown, stigma and cells *C* and *Sc* darker brown; a very narrow brown seam over the cord, interrupted on basal section of M_{1+2}. Veins behind costa glabrous or virtually so, very sparse small trichia on veins *R* and R_1. Venation: Cell R_3 only slightly constricted at midlength; a short element R_{1+2+3} present; cell *1st* M_2 with outer end pointed, *m* much longer than the petiole of cell M_1, *m-cu* at near one-third the length of M_{3+4}. Abdominal tergites dark brown, sternites yellowed, hypopygium darkened. Male hypopygium (figs. 3, 4) with ninth tergite, *t,* relatively short, lateral lobes broad, truncated, median emargination very shallow. Outer diststyle, *od,* broad, apex obtuse to subtruncate, surface with short sparse setae; inner style with apex slightly expanded, beak narrowly obtuse. Eighth sternite with posterior margin entire, unmodified.

Holotype, male (KU), Babeldaob (Babelthuap), Palau. Ngarmisukan (Ngaremeskang), Emertao, Feb. 12, 1938 Esaki.

Additional materials: Palau: 1 female, Airai, Ngerimal River, May 26, 1957, Sabrosky; 2 males, one female, Melekiok, in mangroves, May 23, 1957, Sabrosky; 2 males, Ngaremblengui, June 2–4, 1957, at light, Sabrosky; 4 males, 2 females, Ngiwal, May 21, 1957, at light, in jungle, Sabrosky, (US, ALEX).

A female from Ngiwal has a Ceratopogonid attached to the postnotal mediotergite by the caudal end, presumably an accidental association (specimen marked with a red square).

Subfamily LIMONIINAE

The Limoniinae is the larger of the two major subfamilies in the Tipulidae, with several thousand species occurring in all biotic regions. It includes five tribes of which the Limoniini and Eriopterini are represented in Micronesia. The extensive group Hexatomini is not known to occur but there are several genera in the major adjoining islands and the group must be considered as being regional. The remaining regional tribe is the Lechriini with two small genera, *Lechria* Skuse and *Xipholimnobia* Alexander, including only about a score of species in the adjoining Australasian and Oriental regions.

Tribe LIMONIINI

This is one of the largest groups in the family, chiefly because of *Limonia*, the major genus in the Tipulidae, with nearly two thousand species. The overwhelming preponderance of this group in Micronesia has been discussed earlier in this report.

Key to Micronesian Genera of Limoniini

1. Antennae 14-segmented; wings (fig. 5) with *m-cu* at or beyond the fork of *M*, in uncommon cases placed before the fork but not exceeding its own length......**Limonia**
   Antennae 16-segmented; wings (fig. 94, 95) with *m-cu* some distance before the fork of *M*, commonly about three or more times its own length.....................**Orimarga**

Genus **Limonia** Meigen

Amphinome Meigen, 1800, Nouvelle classification des Mouches a deux ailes (Diptera L.) d'apres un plan tout nouveau, p. 15; name preoccupied by *Amphinome* Bruguiere, 1792. Name suppressed by the International Commission on Zoological Nomenclature, 1963, Opinion 678, Bul. Zool. Nomenclature **20:** 339–342.

Limonia Meigen, 1803, Illiger's Mag. Insektenkunde **2:** 262 (Type: *Limonia tripunctata* Fabricius).

Limnobia Meigen, 1818, Syst. Beschreib. europ. Zweifl. Insekten **1:** 116 (Type: *tripunctata* Fabricius).

Unomyia Meigen, 1818, l.c. **1:** 135 (Type: the same. Desig. Coquillett, 1910: 618).

Limnomyza Rondani, 1856, Prodromus Dipterologiae Italicae, p. 185 (type: *tripunctata* Fabricius).

Taphrophila Rondani, 1856, l.c., p. 185 (type: *inusta* Meigen; original designation). On the basis of type designation and the *nomen oblitum* principle, I consider that this name pertains to the present genus and not to *Antocha* Osten Sacken, as was followed by Edwards (1938) and other students (see Alexander, The Entomologist for May 1967: 124–125 for a discussion of the question).

Limonia is one of the largest and most variable of all genera in the Diptera, in the adult stage showing an unusual range and diversity of structure in various organs, particularly the mouthparts, antennae, eyes, wing venation, and the male hypopygium. Some indication of the diversity that occurs is provided herewith.

General Morphology

Head.

Mouthparts.—A few species have these organs exceedingly small to barely evident, in a few cases with the maxillary palpi reduced to a single segment (as in *Limonia citrofocalis* Edwards, Borneo), in others with the segments ranging from two to the normal four, even in the same subgenus (*Geranomyia*). In some groups (as in typical *Limonia*, *Geranomyia*, and *Zelandoglochina*) the mouthparts, especially the labial palpi, are greatly lengthened, in cases being equal to or even exceeding the remainder of the body.

Antennae (fig. 56, 67–69, 81, 82).—The number of antennal segments normally is 14, including the 12-segmented flagellum, the terminal segment or flagellomere in some cases lengthened and constricted at near midlength so the organ may appear to be 15-segmented. In most species the antennae are short but in various species or groups may be moderately lengthened, in some cases nearly to the length of the body. The flagellar segments commonly are oval, or more lengthened to subcylindrical in the species with longer antennae. The flagellar vestiture varies greatly in different species and often provides strong characters for taxonomic study. Certain species, especially in the male sex, have the apices of the individual flagellar segments suddenly narrowed to give the antennae a beadlike or pedicellate appearance. The most striking modifications of the antennae are the various lobal branching of the flagellar segments, as found in certain subgenera (*Rhipidia*, *Eurhipidia*, *Zelandoglochina*, and less evidently in *Idioglochina*). This is found almost exclusively in the male sex and in many species is so striking that at first it was believed that entirely distinct genera were involved, especially in the oldest known group, *Rhipidia*. However, in the case of the antennae and also the mouthparts as mentioned, it was found that while these characters were

relatively stable and usable in restricted faunal areas, such as Europe, Japan, or eastern North America, when the world fauna was considered they broke down almost completely. Thus, in *Geranomyia*, with the mouthparts typically elongated, various species have been found where these are very reduced, being scarcely longer than the condition considered as being within the limits of the typical subgenus *Limonia*. Also, in this same subgenus, species were discovered that showed a surprising range in the numbers of segments of the maxillary palpi, from a single segment to the maximum of four, again indicating limited usefulness in attempting to maintain groups higher than the species level. Further, as regards the elongation of the mouthparts, certain forms in the typical subgenus *Limonia* found in the Oriental fauna belonging to a single limited group (*Limonia hostilis* and allies) show almost the same differences in the relative length of the mouthparts as were discussed for *Geranomyia*. In some species the rostrum is small and quite normal for the subgenus, while other species have the structure of moderate length, progressing through others until the maximum elongation as presently known (in *Limonia tanyrhyncha* Alexander) is attained where the mouthparts are fully one-third as long as the remainder of the body. In all other regards the various species of the *hostilis* group of the subgenus *Limonia* are typical members of the subgenus and must be assigned thereto despite this conspicuous elongation of the mouthparts. For details and figures showing this condition, the Alexander 1964 paper in the list of references may be considered. A comparable account of the antennae in the subgenus *Rhipidia* above mentioned may be found in another paper by the writer (Rev. de Entomologia, **21**: 195–198, figs. 21–25; 1950).

The size of the compound eyes, in relation to the width of the intervening anterior vertex, especially in the male sex, has been considered as possibly providing characters sufficient for subgeneric separation (as in *Atypophthalmus*), where in some species the eyes, especially in the male, are unusually large, being contiguous or virtually so, both above and beneath, to produce a holoptic condition. In other evidently allied species the eyes are somewhat smaller, the anterior vertex being evident as a narrow strip or capillary line that may be about equal in width to a single row of ommatidia of the eye. In other subgenera the vertex is broader, in some cases (as *Melanolimonia*) unusually wide, with the eyes correspondingly smaller.

THORAX.

The thorax similarly shows modifications in certain species, including elongation of the pronotum or the elevation of the praescutum into an erect conical point (*Conorhipidia*) that earlier were believed to provide characters

of subgeneric value but which now have been reduced in rank. The halteres and legs similarly show a considerable range in their relative length and stoutness in the different species. The halteres commonly are short or of moderate length but in the more delicate aerial species are more lengthened. From its description by Nielsen the extreme length of the halteres as presently known would appear to occur in *Limonia* (*Limonia*) *lindbergi* Nielsen (1962), of Afghanistan, where they are described as being longer than the combined head and thorax. The legs of many species are of a length that is considered as being about (the) normal for the family, but in some aerial species are greatly lengthened and correspondingly slender though scarcely attaining the extreme conditions found in many Tipuline groups, as *Dolichopeza*, certain *Leptotarsus*, and various species of *Tipula*. The nature of toothing of the claws has been discussed by Alexander, Edwards, and others, and appears to provide at least supporting characters in an attempt to define subgenera.

WINGS.

The wings of crane flies, including their shape and venation, together with the trichiation of the veins and cells, provide particularly important characters for the defining of subgeneric groups.

An elongation of the prearcular field or wing base is characteristic of some groups, including *Doaneomyia*, *Euglochina*, *Pseudoglochina*, and *Thrypticomyia* (fig. 11, 12, 27, 31). In venation, the length of vein *Sc* relative to the point of origin of *Rs* has long been held to be of value but its actual importance in some groups must be questioned, for example, in *Dicranomyia* where there are numerous species in which the vein varies greatly yet on the basis of hypopygial structure appear to be correctly assigned. A small number of subgenera are defined primarily or in part on the presence of supernumerary crossveins in certain of the cells, including cell *Sc* (*Geranomyia*), R_3 and R_5 (*Dapanoptera*, *Degeneromyia*, *Gressittomyia*, *Laosa*), and *1st A* (*Degeneromyia*, *Discobola*). The arrangement of the outer branches of veins *Sc* and *R* in the vicinity of the stigma is of importance in some groups, especially the free tip of vein Sc_2 in its relation to R_2 (fig. 5). In most species these two elements lie in transverse alignment at the outer end of the apparent vein R_1 (actually veins Sc_2 and R_1 at this point) but in several species, Sc_2 is some distance proximad (as in *Thrypticomyia*) and the element R_{1+2} may project beyond as a short to longer spur (see figs. 101, 102, 103), in some species nearly attaining the margin. The nomenclature of these particular veins was discussed and figured by the writer in an earlier report (in Curran, C. H., The families

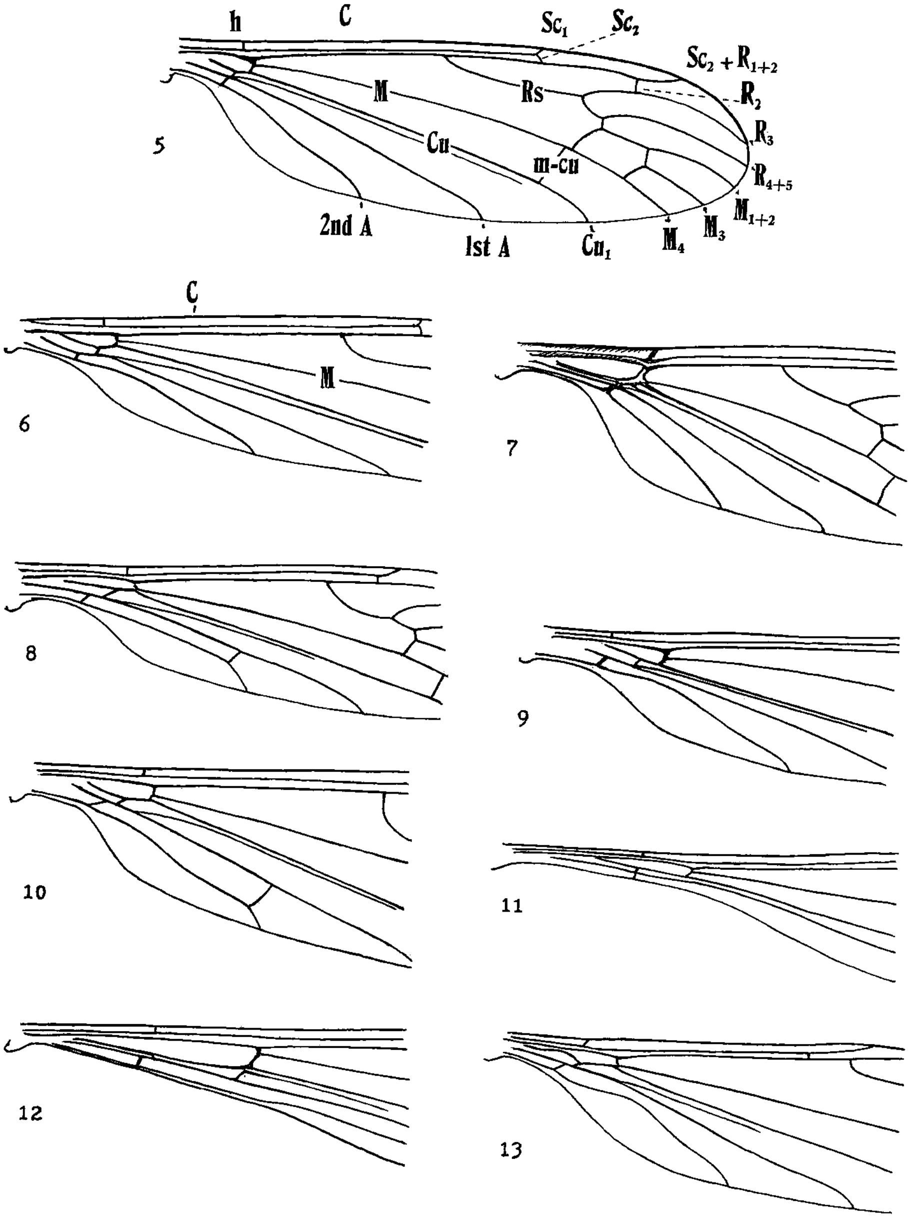

FIGURE 5–13. Genus *Limonia* Meigen; wing bases, venation of Australasian Subgenera. **5.** Wing venation of *Limonia* (*Limonia*) *tripunctata* (Fabricius); genotype of *Limonia*. (Symbols: *A*, Anals; *C*, Costa; *Cu*, Cubitus; *h*, humeral crossvein; *M*, Media; *m-cu*, medio-cubital crossvein; *R*, Radius; *Rs*, Radial sector; *Sc*, Subcosta). **6.** *Limonia* (*Atypophthalmus* Brunetti)—*umbrata* (de Meijere) **7.** *Limonia* (*Dapanoptera* Westwood)—*meijerana* Alexander **8.** *Limonia* (*Degeneromyia* Alexander)—*thais* Alexander **9.** *Limonia* (*Dicranomyia* Stephens)—*sordida* (Brunetti) **10.** *Limonia* (*Discobola* Osten Saken)—*annulata* (Linnaeus) **11.** *Limonia* (*Doaneomyia* Alexander)—*tahitiensis* (Alexander) **12.** *Limonia* (*Euglochina* Alexander)—*yorkensis* Alexander **13.** *Limonia* (*Eurhipidia* Alexander)—*perscitula* Alexander

and genera of North American Diptera, 512 pp., 235 figs., 2 pls; 1934; references on pp. 38, 39, figs. 1–10).

The veins of the outer half of the wing furnish various characters. The relative length and direction of the longitudinal veins beyond the cord are of importance, especially in *Libnotes* and some related groups, where all outer veins are deflected strongly caudad so as to terminate at or beyond the actual wing tip. The word *cord*, as mentioned, was so named by Needham (New York State Museum, Report of the State Entomologist for 1907: 223; 1908), who appreciated the great importance of this feature. This nautical term was adopted as being suggestive of the condition of those veins beyond midlength of the wing where the crossveins *r-m* and *m-cu*, and the deflections of the involved longitudinal veins, are in transverse to oblique alignment to form a virtually straight line. In most species of the genus the cord is at near two-thirds the wing length, the extreme condition being found in *Euglochina* where it is at about six-sevenths to seven-eighths the wing length, or even slightly more. Additional to the *outer cord* a somewhat comparable arrangement of crossveins and deflections of longitudinal veins is found near the wing base, herein termed the *basal cord*. Here there are five such crossveins and deflections, including the humeral crossvein (*h*), between *C* and *Sc*, one of the primary crossveins; two further elements that form the so-called *arculus*, the anterior arculus (*aa*) between veins *R* and *M*, the posterior (*pa*) between *M* and *Cu*. The remaining two elements were termed the *axillary crossveins* by Needham and Edwards but were not further discussed by them. The more anterior of these connects veins *M* and *Cu* and may be called the *basal mediocubital crossvein* (*bm-cu*), the posterior one connecting the two Anal veins, the interanal (*ia*). In the present report I have illustrated the basal portion of the wing for all known subgenera of *Limonia* in the Oriental-Australasian regions, with particular stress on the basal cord (figs. 5–32). The subgenera shown are:

Atypophthalmus Brunetti, 1911 (type: *umbratus* (de M.), as *holopticus* (Brun.)) (fig. 6). E. Pal., Or., Eth., Austral.

Dapanoptera Westwood, 1881 (type: *plenipennis* (Walk.) (fig. 7). Austral.

Degeneromyia Alexander, 1956 (type: *thais* Alex.) (fig. 8). Australasian.

Dicranomyia Stephens, 1829 (type: *modesta* (Meigen)) (fig. 9). Cosmopolitan.

Discobola Osten Sacken, 1865 (type: *annulata* (Linn.), as *argus* (Say)) (fig. 10). Holarctic; other regions except Eth.

Doaneomyia Alexander, 1921 (type: *tahitiensis* (Alex.) (fig. 11). Or., Austral.

Euglochina Alexander, 1921 (type: *cuneiformis* (de M.)) (fig. 12). Eth., Or., Austral.

Eurhipidia Alexander, 1965 (type: *productina* Alex., as *rostrifera* Edwards) (fig. 13). Or., Eth.

Geranomyia Haliday, 1833 (type: *unicolor* (Hal.)) (fig. 14). Cosmopolitan, except New Zealand.

Goniodineura van der Wulp, 1895 (type: *nigriceps* (v.d. Wulp)) (fig. 15). Or., Austral.

Gressittomyia Alexander, 1936 (type: *xenoptera* Alex.) (fig. 16). Or.

Idioglochina Alexander, 1921 (type: *tusitala* (Alex.)) (fig. 17). Marine, Pacific and Indian oceans.

Laosa Edwards, 1926 (type: *iris* Alexander, as *gloriosa* Edwards, preocc.) (fig. 18). E. Pal., Or., Austral.

Libnotes Westwood, 1876 (type: *thwaitesiana* (Westw.)) (fig. 19). E. Pal., Or., Eth., Austral.

Limonia Meigen, 1803 (type: *tripunctata* (Fabr.)) (figs. 5, 20). Virtually Cosmopolitan.

Melanolimonia Alexander, 1964 (type: *morio* (Fabr.)) (fig. 23). Or.

Metalibnotes subgen. n. (type: *fijiensis* (Alex.)) (fig. 22). Austral.

Metalimnobia Matsumura, 1911 (type: *quadrimaculata* (Linn.) as *vittata* (Matsu.)) (fig. 21). Eth., Or., Hol.

Nealexandriaria Alexander, 1966 (type: *tecta* Alex.) (fig. 24). Or., E. Pal., Austral.

Neolibnotes subgen. n. (type: *samoensis* (Alex.)) (fig. 25). Austral.

Paralibnotes subgen. n. (type: *bidentata* (Skuse)) (fig. 26). Austral.

Pseudoglochina Alexander, 1921 (type: *pulchripes* (Alex.)) (figs. 27, 28). Eth., Or., Austral.

Rhipidia Meigen, 1818 (type: *duplicata* (Doane), as *maculata* (Meigen)) (fig. 29). Cosmopolitan, except New Zealand.

Sivalimnobia Alexander, 1963 (type: *fortis* (Brun.)) (fig. 30). Or., E. Pal.

Thrypticomyia Skuse, 1889 (type: *aureipennis* (Skuse)) (fig. 31). E. Pal., Eth., Or., Austral.

Zelandoglochina Alexander, 1925 (type: *huttoni* Edwards) (fig. 32). Austral. (New Zealand); Neotr. (Chile).

The closed discal cell (*1st* M_2) has three veins beyond it, these being M_{1+2}, with M_3 and M_4. In various species this cell is open to the margin by the atrophy of either of the outer crossveins, *m* or the basal section of M_3. In the subgenus *Nealexandriaria* and in *Euglochina projecta*, the only veins of the cell that reach the margin are M_{1+2} and M_4, *m* and both sections of M_3 being atrophied. The position of the *m-cu* crossvein is of taxonomic importance, being at or close to the fork of *M* (in *Dicranomyia* and others), to farther distad,

commonly to midlength of vein M_{3+4}, in some cases considerably farther.

Vein Cu_2 is the weak vein lying immediately behind vein Cu_1 and parallel to it. It commonly is preserved to about opposite or slightly beyond *m-cu*, is retained only basally in some *Euglochina* and *Pseudoglochina*, and is entirely atrophied in *Doaneomyia* and *Thrypticomyia*. All subgenera of *Limonia*, with the exception of *Doaneomyia*, have two Anal veins; some species of *Pseudoglochina* have vein 2nd A partly fused with the posterior border, reducing the size of the cell, as shown by *Pseudoglochina microneura* (fig. 28) and as discussed by Edwards for *P. laticincta* Edwards (in Insects of Samoa, Diptera Nematocera, pp. 78–79; 1928).

The trichiation of the wing veins and cells is of importance. In virtually all species of *Limonia* the outer longitudinal veins beyond the cord bear conspicuous trichia or setae, in some cases these being larger and more conspicuous. In *Libnotes*, especially in the males, the costal trichia are unusually numerous, the outer ones being shorter and stouter to appear spinoid. A very few species in the genus have similar strong trichia in certain wing cells, including the region of the stigma. In most subgenera, microtrichia are present in the cells, these being extremely small and inconspicuous spinules, densely abundant in virtually all cells. In some groups these microtrichia are very reduced in size so as to be evident only under high magnification. In *Euglochina* and *Thrypticomyia* they are lacking or so reduced in size as to be invisible except under very high magnification. Particularly interesting examples of loss of the microtrichia in the genus are found in certain species of the subgenus *Dapanoptera* and even more strikingly so in *Limonia* (*Sivalimnobia*) *pleiades* Alexander, of Mindanao. This last species has almost the entire wing provided with abundant such trichia but on the disk there are seven short-oval window-like areas that are crystal clear, with no sign of microtrichia under any magnification.

Abdomen.

The male hypopygium furnishes unusually strong characters for the separation of both subgenera and species. Despite certain striking modifications and variations produced by lobes and outgrowths that may involve most parts of the organ, there persists a basic uniformity in all structures that confirms our belief that all of these apparently diverse groups actually are closely allied and that a single vast genus is involved in the problem. The typical subgenus *Limonia* has a single simple dististyle, a condition that Edwards (1938) considered as being not necessarily a primitive one, as it appears to be in Trichoceridae and several other generalized groups of Nematocerous Diptera. The division of this simple dististyle into two parts, termed the

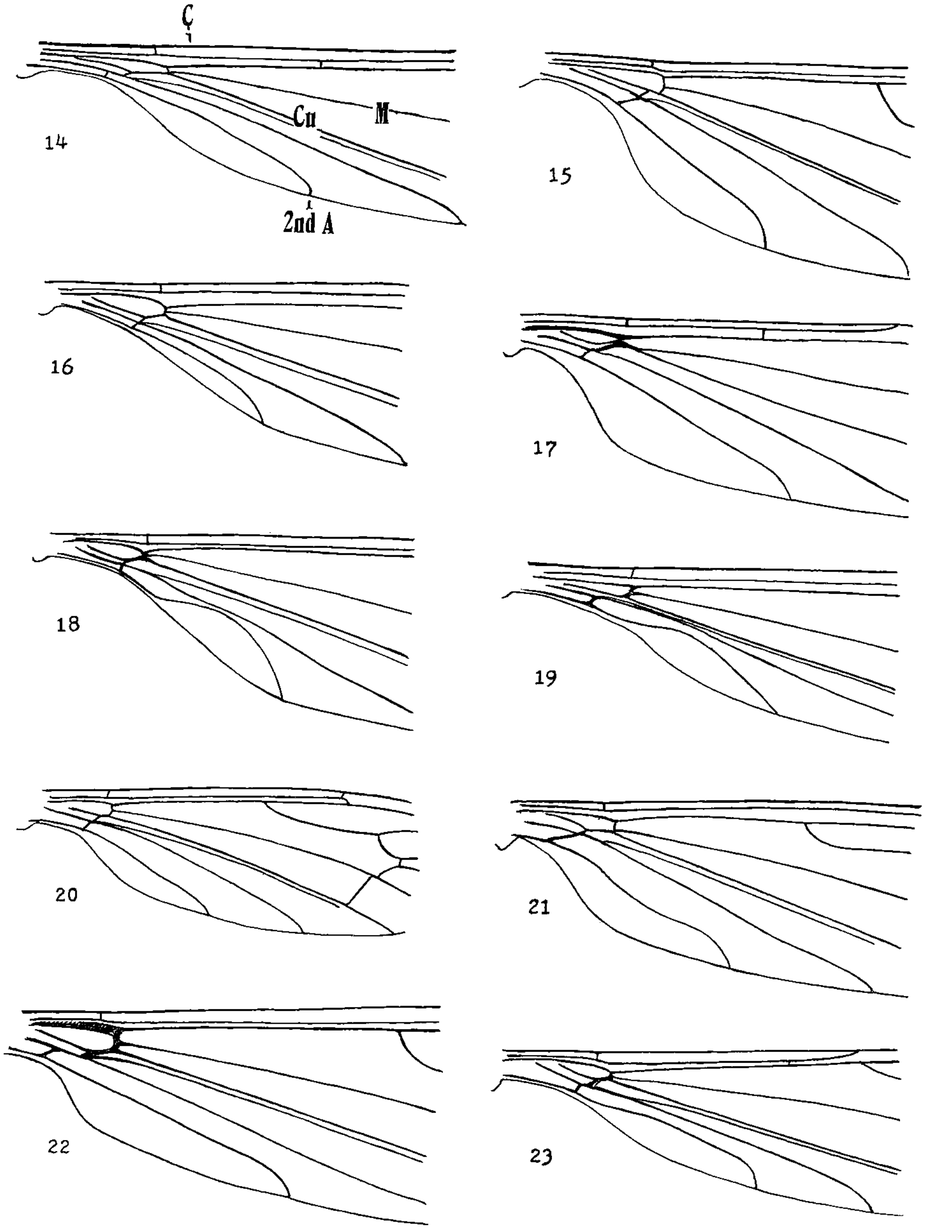

FIGURE 14–23. Genus *Limonia* Meigen; wing bases, venation of Australasian subgenera. **14.** *Limonia* (*Geranomyia* Haliday)—*dybasi* Alexander, n. sp. **15.** *Limonia* (*Goniodineura* van der Wulp)—*nigriceps* (van der Wulp) **16.** *Limonia* (*Gressittomyia* Alexander)—*xenoptera* Alexander **17.** *Limonia* (*Idioglochina* Alexander)—*kotoshoensis* (Alexander) **18.** *Limonia* (*Laosa* Edwards)—*bipartita* Alexander **19.** *Limonia* (*Libnotes* Westwood)—*Thwaitesiana* (Westwood) **20.** *Limonia* (*Limonia* Meigen)—*tripunctata* (Fabricius) **21.** *Limonia* (*Metalimnobia* Matsumura)—*quadrimaculata* (Linnaeus) **22.** *Limonia* (*Metalibnotes* Alexander)—*fijiensis* (Alexander) **23.** *Limonia* (*Melanolimonia* Alexander)—*nigrithorax* (Brunetti) (Symbols: *A*, Anal vein; *C*, Costa; *Cu*, Cubitus; *M*, Media)

dorsal and ventral styles, is a character found in virtually all other subgenera of *Limonia*, discussed in several papers cited elsewhere. In *Dicranomyia*, *Geranomyia*, and others the ventral style bears a beaklike extension termed the rostrum or rostral prolongation. This commonly bears two strong spinoid setae (usually called spines for convenience). The various positions of these spines on the rostrum or more basad on the body of the style have been considered in detail in another report by the writer (Alexander, Philippine Jour. Sci., 55: 38–39; 1934). The number of these rostral spines ranges from one (in most *Melanolimonia*, *Discobola*, etc.) through three or more, reaching a maximum of about 8 to 10 in certain species of *Rhipidia*, *Dicranomyia*, and *Libnotes* (as *quinquegeminata* Alexander of New Hebrides, and *willowsi* Alexander of the Solomons).

The phallosome, occupying the genital chamber, provides what appear to be the strongest and most important characters for defining the subgenera and higher groups in the entire family Tipulidae. In *Limonia*, the central aedeagus varies greatly in different groups, particularly the apex and locations of the paired genital openings. The subtending gonapophyses are generally rather uniform in conformation in the various groups, consisting of dilated flattened blades and an extended production, the mesal-apical lobe.

BIOLOGY

As might be expected in a group of flies as large and diverse as *Limonia*, the immature stages occur in a wide variety of habitats. Although little is known regarding these for species in Micronesia, several of the subgenera in other regions, as Europe, North America, the Hawaiian Islands, and elsewhere, are better known and may be used for comparison. The single most usual larval habitat appears to be in moist or saturated moss cushions or in growths of algae and other plants on wet rock faces or cliffs, the so-called hygropetric habitat. Species living in such places frequently form gelatinous tubes in which the larva lives and pupates. Other habitats are in rotting wood and beneath bark, commonly in association with fungus mycelia, while other species live in fungi, both woody and fleshy. Still other habitats, especially in the tropics, are in decaying vegetation, as in the rotting stems of higher plants, as banana, sugarcane, and the like, or in the damp accumulated humus at the bases of ferns and higher plants, as described by Williams (1943), and others. A highly specialized habitat in the genus is that of the leaf-mining forms, including *Limonia* (*Dicranomyia*) *kauaiensis* (Grimshaw), as first discussed by Swezey (1915, as *foliocuniculator* Swezey) and later by Hardy (1960).

For Micronesia, particular attention is directed to the various marine members of the genus, almost all in the subgenus *Idioglochina*, with numerous species throughout the Pacific and Indian oceans. Such species live in or near the intertidal zones, the immature stages commonly occupying the rocky shores where they live among the mosslike algae growing in the masses of seaweeds of various genera, as *Monostroma*, *Enteromorpha*, *Gloiopeltis*, and *Nemalion*. The important paper on marine Tipulidae by Tokunaga (1940) may be consulted.

As concerns the adult flies, their association with spiders and the use of spider webs, in subgenera such as *Thrypticomyia*, *Euglochina*, *Doaneomyia*, and presumably some others, is of interest. All of these are delicate ethereal forms and the species of *Thrypticomyia* may be cited as an example. They have been recorded as hanging from or dancing on the horizontal webs or threads of spiders that are suspended between bushes or on the walls inside houses. Species, such as *L.* (*T.*) *apicalis* and *L.* (*T.*) *arachnophila* have been recorded as resting on such lines, in cases in groups of a score or more, hanging by their fore tarsi side by side, all see-sawing rapidly up and down and at the same time swaying to and fro, sometimes continuing this performance over long periods. A discussion of this may be found in Alexander (1920: 712) and in several accounts by Edwards (1912), by Meijere (1911), and others, and have been discussed briefly in the present paper under the account of the subgenus *Thrypticomyia*. An account of somewhat similar habits in *Limonia* (*Doaneomyia*) *tahitiensis* has been provided by Cheesman (1932).

Key to Micronesian Subgenera and Species of Limonia

1. Wings with a single Anal vein (fig. 11)..**Doaneomyia**
   (Extralimital)
   Wings with two Anal veins...2
2. Wings with a supernumerary crossvein in cell *1st A*, connecting the two Anal veins
   (fig. 44)..**Discobola 13. boninensis**
   Wings without a crossvein in cell *1st A*..3
3. Mouthparts, especially the labial palpi, produced into an elongate rostrum, commonly about equal in length to the combined head and thorax......**Geranomyia** 4
   Mouthparts not conspicuously lengthened...8
4. Wings unpatterned except for the small pale brown stigma; coloration of mesonotum polished black to dark fulvous, pleura yellow.............................**15. aeruginosa**
   Wings with at least a slight darkened costal pattern, additional to the stigmal area; mesonotum and pleura variable..5
5. Vein *Sc* short, Sc_1 ending about opposite origin of *Rs;* free tip of Sc_2 some distance before level of *Rs*, vein R_1 longer than *Rs*......................................**16. dybasi**
   Vein *Sc* longer, Sc_1 ending beyond midlength of *Rs;* free tip of Sc_2 opposite or immediately before R_2, vein R_1 thus lacking or very short..................................6

6. Wings pale, with a heavy brown pattern, including marginal spots at ends of all longitudinal veins, that at *2nd A* larger; vein *Sc* long, Sc_1 ending shortly before fork of *Rs;* legs uniformly yellow..**17. palauensis**
   Wings strongly darkened, the brown pattern sparse, virtually restricted to the costal region; vein *Sc* short, Sc_1 ending about opposite two-fifths *Rs;* legs with tips of femora and tibiae darkened (*snyderi*)..7
7. Mesonotal praescutum pollinose, with three separate brownish black stripes, the interspaces brown; pleura chiefly light yellow beneath, above with a brownish longitudinal stripe...**18. snyderi snyderi**
   Mesonotal praescutum with three confluent stripes to form a solidly blackened shield; pleura almost uniformly brownish black............**18A. snyderi chichiensis**
8. Wing base long and narrow, *h* some distance before the arculus (figs, 9, 11, 12, 27, 28, 31, 101–103)..9
   Wing base shorter, *h* commonly about opposite the arculus or only slightly before (some *Dicranomyia* and others) (figs. 5, 7, 8, 10, 14–26, 33, 34, 42–44, 50–53, 58–62, 70–74, 78–80, 90–95)..17
9. Wings (figs. 101–103) with vein Cu_2 (the weak vein immediately posterior to the basal section of Cu_1) lacking; interanal crossveins virtually in transverse alignment with the arculus (figs. 31, 101–103)...................................**Thrypticomyia** 10
   Vein Cu_2 present; interanal crossveins some distance before arculus (figs. 24, 28, etc.) 16
10. Male hypopygium (fig. 110) with ventromesal lobe of basistyle greatly elongated, its length exceeding five times the basal diameter......**50. unisetosa perelongata**
    Male hypopygium with ventromesal lobe of basistyle shorter, at most with length not exceeding three times the basal diameter..11
11. Wings (fig. 103) with *Rs* short, subequal to R_{2+3}, weakly angulated at near mid-length, free tip of $Sc_2 + R_{1+2}$ far distad, in transverse alignment with R_2, male hypopygium (fig. 107) with posterior border of tergite truncate; ventral dististyle with prolongation beyond the spines short and stout, subequal in length to either spine...**47. ponapicola**
    Wings (figs. 101, 102) with *Rs* long, exceeding R_{2+3}, free tip of Sc_2 some distance before level of R_2, leaving an element of vein R_1, male hypopygium with posterior border of tergite emarginate; prolongation of ventral dististyle long and slender, much longer than the spines (except in *decussata* where the spines arise from face of style at base of the prolongation)...12
12. Male hypopygium with rostral spines short, less than the length of the prolongation (figs. 105d, 109d)..13
    Male hypopygium (fig. 106) with rostral spines long and conspicuous, longer than the prolongation, placed on face of style; ninth tergite much constricted at near mid-width, lobes with numerous setae, none especially stouter or modified; (wings with R_3 short, about one-half R_{2+3})..**46. decussata**
13. Male hypopygium (figs. 104, 109) with posterior border of tergite shallowly emarginate, lobes low, with numerous setae..14
    Male hypopygium (figs. 105, 108) with posterior border of tergite deeply emarginate, lobes conspicuous, with few setae..15
14. Male hypopygium (fig. 104) with ventral mesal lobe of basistyle with numerous moderately long setae, none modified; apex of rostral prolongation pointed and undivided..**44. arachnophila**

Male hypopygium (fig. 109) with ventral mesal lobe of basistyle with some modified setae; apex of rostral prolongation divided, with one blunt and one pointed apex..**49. tinianensis**

15. Wings with *Sc* long, Sc_1 ending shortly before to nearly opposite origin of *Rs;* male hypopygium (fig. 105) with each tergal lobe bearing three modified setae; ventromesal lobe of basistyle about twice as long as its basal diameter, terminating in a single elongate seta; rostral spines slightly separated, not arising from a common basal tubercle..**45. carolinensis**

Wings with Sc_1 short, *Sc* ending a distance before origin of *Rs* nearly equal to one-half the length of the latter; male hypopygium (fig. 108) with each tergal lobe bearing four modified setae; ventromesal lobe of basistyle longer, about three times its basal diameter, terminating in two modified setae; rostral spines close together from summit of a common basal tubercle.......................**48. tetrachaeta**

16. Wings (fig. 93) with cord at near two-thirds the wing length; Sc_1 ending beyond origin of *Rs;* cell M_2 open by atrophy of basal section of M_3; vein *2nd A* short, ending some distance before level of tip of *Sc*, at near one-third the wing length........... ....**Pseudoglochina 43. ponapensis**

Wings with cord far distad, at or beyond five-sixths the wing-length; Sc_1 ending some distance before origin of *Rs;* cell *1st* M_2 closed (in regional species); vein *2nd A* very long, terminating at or beyond two-thirds the wing length or about opposite the tip of *Sc*..**Euglochina 14. saltens**

17. Wings with two branches of *M* reaching the margin, *m* and both sections of M_3 atrophied (fig. 90).....................................**Nealexandriaria 40. cinereicapella**

Wings with three branches of *M* reaching the margin, cell M_2 open or closed (figs. 91–95, 101–103, etc.)..18

18. Wings with *Sc* short, Sc_1 ending about opposite or before origin of *Rs*.................19

Wings with vein *Sc* longer, Sc_1 ending some distance beyond origin or *Rs*, at from near one-third the length to nearly opposite the fork of *Rs*.............................32

19. Antennae (figs. 67, 69) with lower face of intermediate flagellar segments produced to give a serrate appearance, apex of the extended portion with a few spinoid setae; wings (figs. 61, 62) with Sc_1 some distance before origin of *Rs*, the latter short, subequal to or only slightly longer than basal section of R_{4+5}, vein Sc_2 far retracted or lacking, Sc_1 alone longer than *Rs*.....................................**Idioglochina** 20

Antennae with flagellar segments oval, not produced; wings (figs. 33, 34) with Sc_1 ending about opposite origin of *Rs*, the latter longer than basal section of R_{4+5}, vein Sc_2 less retracted..................................**Dicranomyia** (in part) 22

20. General coloration of body yellow, scutal lobes above the wing root with a small brown spot; intermediate flagellar segments (fig. 69) with lower face long-produced, tipped with stout black spinoid setae; wings, including the veins, yellowed; veins R_1 and R_{2+3} slightly divergent basally, forming a long-oval cell R_1, more conspicuous in male (fig. 62)...**26. tusitala palauicola**

General coloration of body brownish yellow to blackish brown; intermediate flagellar segments beneath less produced, their general conformation transversely oval; wings weakly tinged with brown or gray, including the veins; veins R_1 and R_{2+3} generally parallel to one another (fig. 61)..21

21. General coloration of thorax brownish yellow, praescutum with three broad brown stripes; male hypopygium without spines on ventral dististyle; legs with claws bearing two or more spines, the outermost largest.................**24. kotoshoensis**

General coloration of thorax dull blackish brown, slightly pruinose, without distinct

pattern; male hypopygium (fig. 65) with two strong rostral spines near apex of the ventral dististyle; legs with claws bearing a single long spine.........**25. obesula**

22. Wings (fig. 33) with cell M_2 open by atrophy of vein *m* (*misera* group).....................23
Wings (figs. 34, 42, 43) with cell *1st* M_2 closed..25

23. Wings with vein *Sc* short, Sc_1 ending some distance before origin of *Rs*, Sc_2 near tip of the short vein Sc_1; male hypopygium (fig. 37) with rostral prolongation of ventral dististyle (*d*) angulated, very slender, with two strong spines...**4. pontophila**
Wings with vein *Sc* longer, Sc_1 ending opposite or just before origin of *Rs*, Sc_2 far retracted, vein Sc_1 subequal to or longer than *Rs*...24

24. Male hypopygium (fig. 36) with ventral dististyle (*d*) very large, its area more than three times that of the basistyle; rostral prolongation very short, with a single powerful black spine; gonapophysis with mesal-apical lobe parallel-sided, apex not expanded..**3. pectinunguis**
Male hypopygium (fig. 35) with ventral dististyle (*d*) small, its area less than that of the basistyle; rostral prolongation bulbous, with a single slender spine; gonapophysis with tip of mesal-apical lobe slightly expanded..................**2. boniniana**

25. Wings not or scarcely patterned, except for the stigma and narrow seams over cord and certain other veins; no darkened spots in cell *1st A* adjoining vein *2nd A;* male hypopygium (figs. 45–47) (*tristis* group)...26
Wings evidently patterned with brown spots on certain veins, including at least one area on *M* and two in cell *1st A* adjoining vein *2nd A;* male hypopygium (figs. 38–41) (*punctulata* group)...28

26. Male hypopygium (fig. 46) with ventromesal lobe of basistyle narrowed outwardly, the apex with two or three strong setae..**11. sordida**
Male hypopygium (figs. 45, 47) with ventromesal lobe of basistyle broadly obtuse at apex, with several strong setae..27

27. Male hypopygium (fig. 45) with posterior border of tergite truncate, without emargination; apex of rostral prolongation blackened, spines small, sessile; wings subhyaline...**10. illingworthi**
Male hypopygium (fig. 47) with posterior border of sternite feebly emarginate; apex of rostral prolongation pale, the two spines at summit of a low tubercle; ground color of wings weakly dusky..**9. basifusca**

28. Male hypopygium (fig. 38) with two small straight rostral spines, ventral style very large, in area approximately three times the basistyle; (wings with a single darkening on vein *M* at near midlength, costal cell with a single or few darkened clouds, cell *1st A* with two brown spots adjoining vein *2nd A*) (*fullawayi*)...........29
Male hypopygium (figs. 39–41) with a single rostral spine, ventral style of moderate size, its area not exceeding twice that of the basistyle.......................................30

29. Wings with ground color pale; costal fringe of male long, subequal to the diameter of cell *C*...**5. fullawayi fullawayi**
Wings strongly darkened; costal fringe of male short.........**5A. fullawayi phaeoptera**

30. Male hypopygium (fig. 40) with rostral spine on lower margin near apex of prolongation, curved upward to appear tusklike; ventral style small, subequal to the basistyle; wings with small brown spots along certain veins, including two or three on each of *M*, *Cu*, and R_{4+5}..**7. guttula**
Male hypopygium with rostral spine long and straight, placed on upper margin of prolongation; ventral style larger, exceeding the basistyle in area; wings not patterned as above..31

31. Size large (wing of male over 9 mm.); male hypopygium (fig. 39) with rostral spine placed at outer angle of the stout prolongation; mesal-apical lobe of gonapophysis a simple blackened spine..**6. guamicola**

Size smaller (wing of male about 5 mm.); male hypopygium (fig. 41) with rostral spine very long, at near midlength of the slender prolongation; mesal-apical lobe of gonapophysis long and slender, with a small marginal tooth............**8. leptomera**

32. Wings (fig. 43) with *m-cu* at or close to fork of *M*..33

Wings with *m-cu* some distance beyond the fork of *M*.......................................36

33. Outer tarsal segments snowy white, including outer end of basitarsus and remaining segments; (male hypopygium (fig. 48) with two dististyles)......**Dicranomyia** (in part) (*swezeyana* group)..**12. swezeyana**

Tarsi darkened; (male hypopygium with a single dististyle, in local species this strongly narrowed outwardly) (figs. 83, 84)...........................(**Limonia,** s.s.) 34

34. Wings (fig. 79) with cell M_2 open by atrophy of *m;* (male hypopygium, figs. 84, 85)...**35. yapicola**

Wings (fig. 78) with cell *1st* M_2 closed..35

35. Thoracic pleura brownish yellow, striped longitudinally with brownish black; antennae of male relatively long, flagellar segments (fig. 81) strongly pedicillate; size large (wing of male about 5 mm.); venation (fig. 78); male hypopygium (fig. 83)..**33. elephantella**

Thoracic pleura testaceous yellow, unpatterned; antennae of male shorter, flagellar segments (fig. 82) not pedicillate; size smaller (wing of male about 4.2 mm.)... ....**34. elephantina**

36. Wings (figs. 70–74) with *Rs* and basal section of R_{4+5} nearly straight, short and oblique; outer end of vein R_3 decurved, ending at or shortly beyond wing apex......37

Wings (figs. 58, 60, 80, 92) with *Rs* long, arcuated or slightly angulated at origin (some *Goniodineura*); vein R_3 not or only slightly decurved outwardly, ending shortly before wing apex...45

37. Wings with Anal veins beyond bases convergent, *2nd A* arched, narrowing the cell (fig. 73)...38

Wings with Anal veins nearly parallel basally, *2nd A* only slightly arched (fig. 59)......45

38. Wings with supernumerary crossveins in either cell R_3 or R_5 or both............**Laosa** (Extralimital)

Wings without supernumerary crossveins...................................**Libnotes** 39

39. Wings with extensive dark markings that include complete brown bands at base beyond arculus and over the cord, without darkened spots or streaks on veins before and beyond the cord..**27. kusaiensis**

Wings without brown crossbands as described, with darkened spots and streaks on veins (except in *notata*)..40

40. Size large (wing of male over 20 mm.); wings with vein M_4 unusually long, approximately twice M_{3+4} (fig. 71)...**28. majorina**

Size smaller (wing of male usually less than 15 mm.); wings with vein M_4 shorter, less than twice M_{3+4}, the veins commonly subequal in length or with M_4 shorter (figs. 72, 74)..41

41. Wings (fig. 72) with free tip of Sc_2 some distance before R_2, vein M_4 shorter than M_{3+4}; wing membrane extensively clouded with pale brown and with sparse but conspicuous darker brown areas on veins; (legs with extreme tip of femur and base of tibia yellowed)..**30. sabroskyi**

Wings (fig. 74) with free tip of Sc_2 and R_2 in approximate transverse alignment, vein M_4 subequal to or longer than M_{3+4}; wing membrane pale yellow, veins unpatterned or with numerous small brown dots on longitudinal veins before and beyond the cord; (legs yellowed, if patterned, tips of femora and bases of tibiae blackened) 42

42. Wings with longitudinal veins before and beyond the cord with abundant small brown spots..43

Wings without darkened spots or dots on longitudinal veins, the chief darkened pattern including marks at origin of *Rs*, tip of *Sc*, and the stigma; (veins M_4 and M_{3+4} subequal)..44

43. Wings (fig. 73) with vein M_4 about one-half longer than M_{3+4}; darkened wing pattern restricted to the veins...**31. strigivena**

Wings (fig. 74) with veins M_4 and M_{3+4} subequal; darkened wing pattern including spots both along the veins and in the posterior cells........................**32. trukensis**

44. Legs yellow; wings with the ground faintly yellowed, virtually unpatterned except for brown spots at stigma and at tip of vein *Sc;* veins M_4 and M_{3+4} subequal......... ....**29. notata notata**

Legs yellow, femora broadly dark brown to black at or shortly before tips, base of fore tibia narrowly darkened; wings with ground whitened, more conspicuously patterned with dark brown, the largest areas at *Sc*, with further seams over cord and outer end of cell *1st* M_2*;* vein M_4 shorter than M_{3+4}...**29A. notata solomonis**

45. Wings (fig. 91) with vein *Sc* short, Sc_1 ending about opposite outer end of the very short straight *Rs*..**Neolibnotes 41. biprotensa**

Wings (figs. 58, 60, 80, 92) with vein *Sc* long, ending some distance beyond base of the long arcuated *Rs*..46

46. Male hypopygium (figs. 63, 64) with two dististyles, the rostral prolongation of the ventral style with two very unequal spines, the outer stout and conspicuous; tergite posteriorly conspicuously emarginate, lobes with long setae; ventromesal lobe of basistyle inconspicuous..**Goniodineura** 47

Male hypopygium (figs. 86–89, 98) with a single dististyle, without rostral spines; tergite with posterior margin not conspicuously emarginate or setose; ventromesal lobe of basistyle long and conspicuous, apex with parallel corrugations and striae (*Metalibnotes*) or low and simple with abundant setae throughout (*Paralibnotes*)......51

47. Body and legs uniformly yellow..**19. delicatior**

Thorax and abdomen pale, more or less distinctly patterned with darker (except in *pictoides*); femora yellow with a narrow darkened subterminal or terminal ring 48

48. Tips of femora narrowly darkened; brown wing pattern restricted, the arcular area not reaching costa..49

Darkened femoral ring subterminal; brown wing pattern more extensive, the arcular area reaching costa..50

49. Thorax yellowed, unpatterned..**23. pictoides**

Mesonotum yellow, conspicuously patterned with brown, including six separate areas on the praescutum and scutum..**20. nesopicta**

50. Mesonotum almost uniformly brownish black to black, very restrictedly patterned with pale, pleura abruptly yellow; antennal flagellum light yellow......**21. phaeonota**

Mesonotum yellow or fulvous, in cases extensively patterned with brown, including a central praescutal stripe, the lateral darkenings marginal; pleura yellow, com-

monly patterned with dark brown, in cases uniformly yellow; antennal flagellum brownish black (in some individuals thorax more uniformly fulvous)...**22. phaeozoma**

51. Male hypopygium (fig. 98) with posterior border of tergite gently convex to subtruncate, not or scarcely emarginate; mesal face of basistyle with a low simple lobe that bears strong setae over the entire surface; dististyle apically extended into a long narrow point; aedeagus very long and narrow, the paired genital tubes virtually without lateral flanges; wings unpatterned, without stigmal darkening..**Paralibnotes 42. bidentatoides**

Male hypopygium (figs. 86–89) with posterior border of tergite very gently emarginate; mesal face of basistyle extended into a conspicuous lobe, its apex with faint corrugated parallel striae, without setae; dististyle at apex a simple point or else unequally bidentate; aedeagus shorter and broader, with narrow lateral margins or flanges; wings with at least the stigma darkened.........**Metalibnotes** 52

52. Thoracic pleura yellow, praescutal stripes light brown; wings pale, slightly patterned with darker; inner end of cell *1st* M_2 scarcely arcuated; male hypopygium with apex of dististyle bidentate (fig. 88)..**37. edgari**

Thoracic pleura yellow, dorsally patterned with brown, praescutal stripes conspicuous, dark brown; wings with the darkened pattern more evident; inner end of cell 1*st* M_2 arcuated; male hypopygium with apex of dististyle terminating in a single spine...53

53. Wings with darkened pattern relatively inconspicuous, stigma small; male hypopygium with tergal lobes only slightly developed, each with about three major setae; gonapophysis with apex of mesal-apical lobe slender, subacute (fig. 89)... ....**39. sentifera**

Wings more heavily patterned with darker, including a conspicuous brown stigmal area; male hypopygium with tergal lobes evident, with more numerous setae; gonapophysis with apex of mesal-apical lobe obtuse.......................................54

54. Male hypopygium with apex of mesal-apical lobe of gonapophysis broad, subtruncate...**38. jocularis**

Male hypopygium with apex of mesal-apical lobe of gonapophysis narrow, subobtuse (fig. 86)...**36. beardsleyi**

Subgenus **Dicranomyia** Stephens

Furcomyia Meigen, 1818, Syst. Beschreib. europ. Zweifl. Insekten, **1:** 133; unavailable name, cited in the specific synonymy only (type: *lutea* Meigen).

Dicranomyia Stephens, 1829, Cat. British Ins., **2:** 243 (type: *modesta* Meigen, designated by Coquillett, 1910: 533).

Glochina Meigen, 1830, Syst. Beschreib. europ. Zweifl. Insekten, **6:** 280 (type: *sericata* Meigen).

Siagona Meigen, 1830 (l.c., 6: plate 65, fig. 7 (type: *sericata* Meigen).

Numantia Bigot, 1854, Ann. Soc. Ent. France, Ser. 3, **2:** 470 (type: *fusca* Meigen).

Telecephala Pierre, 1921, Bull. Soc. Sci. Nat. du Maroc, 1, no **1:** 21–22, 3 figs. (type: *longicollis* Macquart).

Tedotea Santos Abreu, 1923, Mem. R. Acad. Cien. Art., Barcelona, **18:**

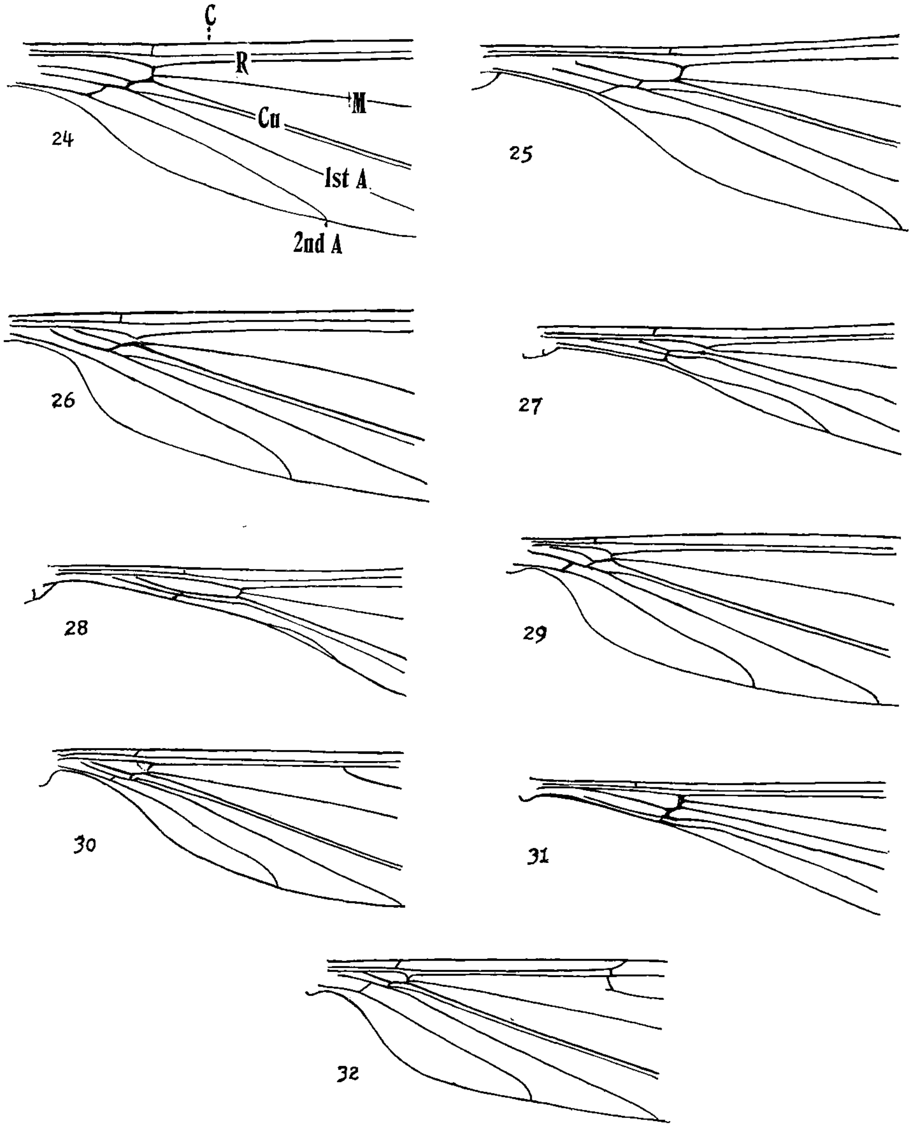

FIGURE 24–32. Genus *Limonia* Meigen; wing bases, venation of Australasian subgenera. **24.** *Limonia* (*Nealexandriaria* Alexander)—*tecta* Alexander **25.** *Limonia* (*Neolibnotes* Alexander)—*samoensis* (Alexander) **26.** *Limonia* (*Paralibnotes* Alexander)—*bidentata* (Skuse) **27.** *Limonia* (*Pseudoglochina* Alexander)—*ponapensis* Alexander **28.** *Limonia* (*Pseudoglochina* Alexander)—*microneura* Alexander **29.** *Limonia* (*Rhipidia* Meigen)—*duplicata* (Doane) **30.** *Limonia* (*Sivalimonia* Alexander)—*uma* Alexander **31.** *Limonia* (*Thrypticomyia* Skuse)—*arachnophila* Alexander **32.** *Limonia* (*Zelandoglochina* Alexander)—*huttoni* (Edwards) (Symbols: *A*, Anal veins; *C*, Costa; *Cu*, Cubitus; *M*, Media; *R*, Radius)

111–112, fig. 23 (male hypopygium), plate 3, fig. 28 (wing, in color) (type: *domestica* Santos Abreu, nec *domestica* Osten Sacken, 1860).

Dicranomyia is the largest and one of the better known subgenera in *Limonia*. In the local fauna eleven species presently are known, distributed in four groups.

The adult characters generally are as in *Limonia,* s.s., differing most evidently in the details of venation and structure of the male hypopygium. In the venation there is an unusual range in the length of the subcostal vein, in the majority of the known species this ending nearly opposite the origin of *Rs*, in others some distance beyond (in the local fauna only in species 12, *swezeyana*). Until recently primary stress had been placed on the length of this vein for the separation of *Dicranomyia* from *Limonia,* s.s., and certain other subgenera, but it now is believed that the structure of the male hypopygium provides stronger and more reliable characters for the definition of subgeneric groups. In *Dicranomyia* there are two separate diststyles, one lying above the other and being designated as the *dorsal style*, the larger fleshy element comprising the *ventral style* which is produced on its inner face into the so-called rostral prolongation that bears one, or more commonly two, modified spinoid setae or spines.

A. The **misera** group

(species 2–4)

2. Limonia (**Dicranomyia**) **boniniana** Alexander, n. sp. (figs. 33, 35)

Belongs to the *misera* group; mesonotum light brown, praescutum with a narrow darker brown stripe, lateral areas less evident, pleura light brown with a longitudinal dorsal brown stripe; legs brownish yellow; wings weakly tinged with brown, Sc_1 ending opposite origin of *Rs*, Sc_2 far retracted, cell M_2 open by atrophy of *m;* male hypopygium small, especially the ventral diststyle, rostral prolongation large; gonapophysis with mesal-apical lobe widened outwardly, apex obtuse.

Male: Length about 4.5–5 mm.; wing 5.3–6 mm.; antenna about 1–1.2 mm.

Female: Length about 5 mm.; wing 5.5 mm.

Rostrum very stout at base, short, brownish black; mouthparts slender, elongate, black; palpi black. Antennae with scape brownish yellow, pedicel slightly darker, flagellum yellowish brown; basal flagellar segments nearly globular, with abrupt short apical pedicels, verticils slightly longer than segments; outer two or three segments more oval, terminal one slender. Front and anterior vertex buffy, posterior vertex brown, central part slightly pruinose.

Pronotum dark brown. Mesonotal praescutum gray with three brown stripes, more than anterior half of central stripe paler brown, in some specimens more uniformly light brown, the lateral stripes subobsolete; scutal lobes brown, central area and scutellum more gray pruinose; postnotum brownish gray. Pleura obscure brownish yellow to light brown, with a narrow dorsal darker brown longitudinal stripe extending from cervical region to abdomen, with a second small darkened line on sternopleurite. Halteres dirty yellow. Legs with fore coxae pale brown, remaining coxae and trochanters yellow, remainder of legs brownish yellow;

claws with a single long straight basal spine, with a further small more delicate tooth. Wings (fig. 33) weakly tinged with brown, stigma lacking; veins pale brown. Longitudinal veins beyond cord with macrotrichia, more basally with trichia at outer end of basal section of Cu_1; extreme tips of Anal veins with one or few trichia. Venation: *Sc* relatively long, Sc_1 ending nearly opposite origin of *Rs*, Sc_2 far retracted, Sc_1 alone subequal to *Rs*; cell M_2 open by atrophy of *m*; *m-cu* before fork of *M*.

Abdomen dark brown, basal sternites yellowed, hypopygium yellowish brown. Male hypopygium (fig. 35) small; ninth tergite, *t*, transverse, margins conspicuous, posterior border shallowly emarginate, lobes low; a submarginal row of strong setae crossing the tergite. Basistyle, *b*, with ventromesal lobe oval, with long setae. Dorsal dististyle, *d*, an unusually broad curved sickle, narrowed to the acute tip; ventral style very small, its total area much less than that of basistyle, body of style subglobular, with strong setae, rostrum large, stout, with a single well-developed black spine, with a second subatrophied spine at its base. Gonapophysis, *g*, with mesal-apical lobe gently widened outwardly, apex obliquely truncated. Aedeagus terminating in two large rounded lobes into which the genital ducts open; ventral surface on either side of aedeagus with five spines, basal one small, outer ones progressively larger, outermost pair decussate.

DISTRIBUTION: Bonin Islands.

Holotype, male, (US 72329) Chichi-jima, Chihiro-iwa, 'Mulberry Beach,' April 11–22, 1958 Snyder. Allotopotype, female (US), with the type. Paratopotypes, 1 male, 1 female. Paratypes, males and females, Chichijima Group, Anijima, Southwest Bay, on beach, May 17, 1958, Snyder; Omura, on Camp Beach, April 2–25, 1958; Ototo Jima, April 9, 1958; Hahajima, Okimura, April 26—June 9, 1958, all Snyder (US, BISHOP, ALEX).

Limonia (*Dicranomyia*) *boniniana* is quite distinct from other regional members of the *misera* group, including *L.* (*D.*) *pectinunguis* Tokunaga, *L.* (*D.*) *pontophila* Tokunaga, *L.* (*D.*) *halobia* Tokunaga, *L.* (*D.*) *trifilamentosa* Alexander, and others. All such species differ among themselves chiefly in hypopygial structure, in the present fly particularly the ventral dististyle and the gonapophyses. It is most similar to *halobia*, described from Amakusa Island, Kyushu, Japan, differing in characters of the styli and phallosome. It seems certain that all species of the group as listed will be found to have the immature stages marine, as presently known for all species listed above and being indicated by the records of occurrence for the present fly.

3. Limonia (Dicranomyia) pectinunguis Tokunaga (fig. 36)

Limonia (*Dicranomyia*) *pectinunguis* Tokunaga, 1940, Kontyû, 1940, **14:** 143–145, fig. 2 (wing, male), figs. 9, 11 (male hypopygium), fig. 13 (antenna, male), fig. 18 (claw, male); July 1940.

Limonia (*Dicranomyia*) *neomisera* Alexander, 1940, Annot. Zool. Japan., **19:** 208–210, fig. 6 (venation), fig. 18 (male hypopygium); September 1940.

Types of *pectinunguis* from Lelo, Kusaie, Caroline Is.; of *neomisera*, Rota, Mariana Is.

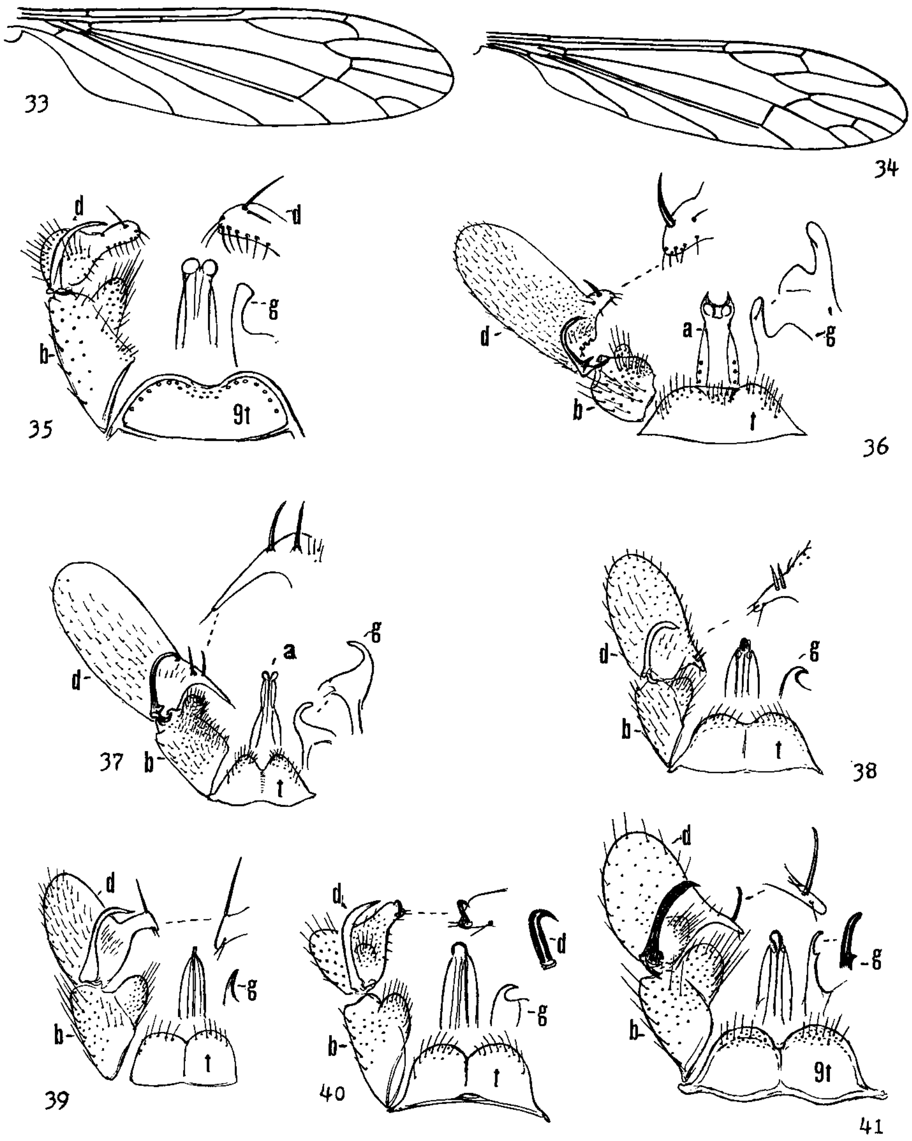

FIGURE 33.–41. Genus *Limonia* Meigen; Subgenus *Dicranomyia* Stephens. **33.** *Limonia* (*Dicranomyia*) *boniniana* Alexander, n. sp.; venation **34.** *Limonia* (*Dicranomyia*) *guttula* (Alexander); venation **35.** *Limonia* (*Dicranomyia*) *boniniana* Alexander, n. sp.; male hypopygium **36.** *Limonia* (*Dicranomyia*) *pectinunguis* Tokunaga; male hypopygium **37.** *Limonia* (*Dicranomyia*) *pontophila* Tokunaga; male hypopygium **38.** *Limonia* (*Dicranomyia*) *fullawayi* (Alexander); male hypopygium **39.** *Limonia* (*Dicranomyia*) *guamicola* Alexander; male hypopygium **40.** *Limonia* (*Dicranomyia*) *guttula* (Alexander); male hypopygium **41.** *Limonia* (*Dicranomyia*) *leptomera* Alexander, n. sp.; male hypopygium (Symbols: *a*, aedeagus; *b*, basistyle; *d*, dististyles; *g*, gonapophysis; *t*, ninth tergite).

MALE: Length about 4.5–5 mm.; wing 4–5 mm.

FEMALE: Length about 5.5–6 mm.; wing 4.8–5.5 mm.

Rostrum brownish black, subequal in length to remainder of head, stout, slightly decurved to appear trunklike; palpi brownish black to black. Antennae obscure yellow to pale brown, with pale greenish tints; flagellar segments subglobular to short-oval, outer two segments subequal in length. Head light brown, sparsely pruinose; anterior vertex narrow.

Pronotum and mesonotum yellow pollinose, praescutum with a broad median cinnamon brown stripe, lateral stripes more brownish gray; scutal lobes dark brown, median area and scutellum paler yellowish brown; postnotum brown, slightly gray pruinose. Pleura brownish yellow to light gray with a narrow brown longitudinal stripe that extends from cervical region to abdomen, ventral stripe paler brown. Halteres with stem short, yellow, knob light brown. Legs with coxae and trochanters yellowed; fore femora brown, bases narrowly yellowed, posterior femora chiefly yellow, tips narrowly darkened; tibiae and tarsi obscure yellow to brownish yellow; claw at base with five slender teeth to appear comblike. Wings strongly infuscated, without pattern, veins darker brown. Trichia on veins beyond general level of cord, including *Rs* and in cases on outer ends of *M* and *2nd A*. Venation: *Sc* long, Sc_1 very long, exceeding *Rs*, ending shortly before origin of *Rs*; *m-cu* close to fork of *M*. One female (Mutunlik, March 1, 1953) has the venation of both wings abnormal, with the basal section of vein M_3 lacking, leaving the distal section free in the membrane, somewhat as is the case in *Limonia* (*Dicranomyia*) *suspensa* Alexander, of Japan.

Abdominal tergites dark brown, sternites and the large hypopygium yellow to brownish yellow. Male hypopygium (fig. 36) with ninth tergite, *t*, transverse, lateral angles extended, posterior border nearly truncate, the lobes scarcely differentiated from the median area, with stout black setae. Basistyle, *b*, very small when compared with the large ventral dististyle, nearly equal in length and breadth, ventromesal lobe very small. Dorsal dististyle, *d*, a strongly curved yellow sickle; ventral style four or more times larger than the basistyle, rostral prolongation short, compressed, with a single powerful black spine at near midlength, placed at or shortly below the border, with a second normal seta more basally on face of style; vestiture of ventral style chiefly of short scattered setae. Gonapophysis, *g*, with mesal-apical lobe erect, apex obtuse, with a low expansion or flange on outer half. Aedeagus, *a*, stout, apex bilobed, each lobe subcircular, outer end produced into a nearly hyaline broad-based spine.

The condition of the spines of the ventral dististyle is suggestive of the condition found in species of the subgenus *Goniodineura*, as discussed and figured later under that group. The spinous lobes of the aedeagus similarly suggest the structure found in several species in the subgenus *Geranomyia* (as discussed and figured by Alexander, Rev. Ecuat. Ent. Par., 2: 51–67, figs. 10–32; 1954). It may be noted that the generally similar and apparently allied *Limonia* (*Dicranomyia*) *pontophila* Tokunaga (species 4) has these lobes of the aedeagus rounded, without spines.

DISTRIBUTION: Widespread in Micronesia.

S. MARIANA IS. ROTA: Sonson-Sabana, Nov. 4, 1937, Esaki; type of *neomisera* (KU). Teteto-Tatacho-Sonson, Nov. 5, 1937; Sonson, Feb. 4, 1936, Esaki; (KU). GUAM: May 9, 1956, Clagg (BISHOP).

PALAU ANGAUR: Feb. 3, 1948, Dybas (CM). PELELIU: east coast, Aug. 1, 1945, Dybas (CM).

KAPINGAMARANGI A. RINGUTORU I., (Greenwich I): Aug. 25, 1954, W. A. Niering (US). KUSAIE. LELO I. (Lele), on shipboard, at light, Nov. 21, 1937, Esaki; "at light on shipboard about 300 meters from shore, associated with *Limonia* (*Dicranomyia*) *pontophila* Tokunaga and *L.* (*Idioglochina*) *kotoshoensis* Alexander"; marine (see Tokunaga 1940). Malem, Dec. 15, 1937, Esaki (KU). METANLUK (Mutunlik), alt. 22 meters, Jan. 27, April 30, Feb. 5–15, March 1, 1953, light trap, Gates Clarke (US). The same, 16 meters, Jan. 23–24, 1953, Gressitt (BISHOP). TARINGA I. July 23, 1954, Niering (US).

MARSHALL Is. ENIWETOK A.: Aniyaanii I., at light Aug. 24, 1956, Tuthill. Same, Jobtan (Japtan) I., Aug. 28–30, 1956, Tuthill. Elugelab I., Jan. 28, 1951, sweeping *Scaevola*, Y. Oshiro (BISHOP).

4. Limonia (Dicranomyia) pontophila Tokunaga (fig. 37).

Limonia (*Dicranomyia*) *pontophila* Tokunaga, 1940, Kontyû, **14:** 142–143, fig. 1 (wing, female), figs. 7–8 (male hypopygium), fig. 12 (antenna, male).

MALE: Length about 5–5.2 mm.; wing 4.2–4.8 mm.

General coloration of body brown, appearing darker in dry specimens. Legs brown; claws small, basal teeth small, broadly triangular in outline. Wings pale brownish yellow, veins darker brown. Longitudinal veins beyond general level of origin of *Rs* with small trichia, including also a few on outer end of *2nd A*. Venation: Sc_1 ending before origin of *Rs; m-cu* at fork of *M*, subequal to distal section of Cu_1; cell *2nd A* broad.

Male hypopygium (fig. 37) with lateral borders of ninth tergite, *t*, produced, narrowed outwardly; posterior border with a deep emargination, setae of lobes moderately long. Basistyle, *b*, small, its area from about one-third to one-fourth that of the ventral dististyle; ventromesal lobe and mesal face of style with abundant setae, outer parts with small sparse setae, virtually lacking on outer third. Dorsal dististyle, *d*, strongly curved outwardly, tip obtuse; ventral style with rostral prolongation more sclerotized, the separated basal spines shorter than the slender apex, the latter unusually glabrous, with a long terminal seta; vestiture of body of style short and pale, inconspicuous. Gonapophysis, *g*, with mesal-apical lobe strongly curved, apex obtuse. Aedeagus with tip bilobed.

Tokunaga's original description is excellent, with figures of the venation and the male hypopygium.

DISTRIBUTION: Mariana and Caroline Islands. Types from Rota I. and Kusaie I.

S. MARIANA IS. AGIGUAN, June 7, 1952 (Y. Kondo). ROTA: Teteto, Nov. 8, 1937, Esaki, (KU). GUAM: Oca Pt., NAMRU 2, June 3–28, 1945, Bohart, Gressitt (CAS). Ritidian Pt., June 28, 1945, Gressitt, June 19, 1945, J.R. Stuntz (CAS). SAIPAN: 1.2 miles east of Tanapag, Dec. 4, 1944, Edgar (BISHOP). TINIAN: near Guaguan Pt., March 22, 1945, Dybas FM (CM).

PALAU AULUPTAGEL (Aurapushekaru), Sept. 1952, Krauss (BISHOP).

KUSAIE. Lelo, Nov. 21, 1937, Esaki (KU).

The type materials from Rota I. were taken in the tidal zone while swarm-

ing above the wet surface of the seaweed-covered cliffs of the coral reefs (Tokunaga, 1940: 143); specimens from Lelo, Kusaie, collected by Esaki, are briefly discussed under the account of *Limonia* (*Idioglochina*) *kotoshoensis* (Alexander) later in the present report.

B. The **punctulata** group

(Species 5–8)

5. Limonia (Dicranomyia) fullawayi fullawayi (Alexander) new emendation (fig. 38)

Dicranomyia fullowayi Alexander, 1915, Canad. Ent., **47:** 79–80, fig. (wing). (Named for David T. Fullaway but misspelled in original description).

Limonia (*Dicranomyia*) *magnistyla* Alexander, 1935, Proc. Linn. Soc. New South Wales, **60:** 62–64, fig. 8 (venation), fig. 14 (male hypopygium).

Type of *fullowayi* from Guam; of *magnistyla* from New Britain. Belongs to the *punctulata* group.

MALE: Length about 4–4.5 mm.; wing 4–5 mm.

FEMALE: Length about 5–5.5 mm.; wing 4.5–5.5 mm.

Rostrum, palpi and antennae black; basal flagellar segments short-oval, outer ones oval, longer than their verticils. Head dark gray; anterior vertex narrow, subequal to two rows of ommatidia.

Mesonotum brownish gray, praescutum with four ill-defined brown stripes, the intermediate pair more distinct; scutal lobes vaguely patterned with brown. Pleura brownish gray with a broad blackened longitudinal stripe. Legs light to medium brown; claw long, slender, strongly curved, with a single strong spine and three or four microscopic more basal spinules. Wings tinged with grayish white, restrictedly patterned with brown, including seams at arculus, *h*, fork of *Sc* and cord; one to a few paler brown clouds in cell *C*, with a single further cloud at near one-third *M;* a narrow transverse subapical band from vein R_3 to M_{1+2}, with two similar gray clouds in cell *1st A* adjoining vein *2nd A;* in most specimens a small brown cloud on costa midway between free tip of Sc_2 and R_3; veins light brown, darker in the patterned parts, interspaces of *C*, *Sc*, and *R* more yellowed. Costal fringe of male long. Venation: Sc_1 ending nearly opposite origin of *Rs*, Sc_2 near its tip; free tip of Sc_2 and R_2 in approximate transverse alignment; cell *1st* M_2 long-rectangular, gently widened outwardly, nearly as long as distal section of M_{1+2}.

Abdomen brown. Male hypopygium (fig. 38) with posterior border of ninth tergite, *t*, shallowly emarginate, lobes obtuse, with long setae; apical margins of lobes broadly thickened. Ventral dististyle, *d*, very large, approximately three times the basistyle; rostral prolongation long and slender, with two small pale spines placed laterally near base of prolongation. Gonapophysis, *g*, blackened, mesal-apical lobe short, curved to a simple acute point.

DISTRIBUTION: Fiji, New Britain, eastern Australia, Micronesia: Mariana and Caroline Islands.

S. MARIANA IS. GUAM: 1911, Fullaway (US). ROTA: Songsong (Sonson), Sabana, Nov. 7, 1937, Esaki; Tatacho—Songsong, Feb. 8, 1936, Esaki (KU).

PALAU BABELTHUAP: Ngaremlengui, June 1–4, 1957 Sabrosky (US); Ngiwal, alt. 1 meter, light trap, Dec. 16, 1953, Gressitt (BISHOP). Koror (Korror), alt. 25 meters, Dec. 11, 1952, Gressitt (BISHOP) Aug. 26, 1952, Feb. 19, March 3, April 5, 1953, at light, Beardsley; April 22, 1957, Sabrosky (US). NGARMID (Arumizu), Jan. 31, 1938 Shiro Murakami (KU). PONAPE Colonia, Agr. Expt. Sta., 16 meters, light trap, Jan. 6–15, 1953, Gressitt (BISHOP); Colonia, Jan. 17, 1953 Gates Clarke (US); Mt. Tamatamansakir, 180 meters, at light, Jan. 19, 1953 Gressitt (BISHOP); Nanponmal, light trap in cut native forest, Jan. 10–12, 1953, Gressitt, (BISHOP). TRUK: Fefan—Mesa—Urunna, Nov. 15, 1937, Esaki (KU) (see Alexander, 1940: 210). TON: (Tol), Mt. Uniböt, 32–390 meters, at light in native forest, Dec. 30, 1952—Jan. 4, 1953, Gressitt (BISHOP). MOEN: Mt. Teroken, Nantaku, lower slopes, Dec. 28, 1952—January 5, 1953, Gressitt (BISHOP). YAP: Hill behind Yaptown, light trap, 50 meters, Dec. 1, 1952 Gressitt (BISHOP). Mt. Madaade (Matade), 95 meters, Dec. 1, 1952, Gressitt (BISHOP).

5A. Limonia (**Dicranomyia**) **fullawayi phaeoptera** Alexander, n. subsp.

Very similar in size and general appearance to typical *fullawayi* Alexander, differing in the strongly darkened wings and in the shorter costal fringe of the male, but from the structure of the hypopygium apparently only racially distinct from *fullowayi*. Wings strongly infuscated, with a still darker pattern that is distributed as in *fullowayi* but with more numerous areas in cells *C* and R_3.

Holotype, male (US 72330), Kusaie, Caroline Is., Hill 1010, altitude 300 meters, April 13, 1953, in light trap, Gates Clarke. Allotopotype, female (US, BISHOP, ALEX). Paratopotypes, 4 males, 2 females, with types.

6. Limonia (**Dicranomyia**) **guamicola** Alexander (fig. 39)

Limonia (*Dicranomyia*) *guamicola* Alexander, 1942, Bull. B.P. Bishop Mus., **172:** 196–197, figs. (venation, male hypopygium).

Known only from the unique type male, Guam, S. Mariana Is.

MALE: Length about 8 mm.; wing 9 mm.

Belongs to the *punctulata* group; general coloration of thorax reddish brown, variegated with darker, including a narrow longitudinal brownish black pleural stripe. Legs with femora pale brown, tips vaguely darkened; claw elongate, gently curved, virtually simple, without elongate spines and with three tiny denticles at base, the outermost largest. Wings brownish yellow with a restricted brown pattern distributed as in the group, including the usual two spots adjoining vein *2nd A;* vein Sc_1 ending a short distance beyond origin of *Rs*. Abdomen reddish brown, hypopygium obscure yellow. Male hypopygium (fig. 39) with ninth tergite, *t*, large, posterior border gently emarginate, lobes obtusely rounded. Dorsal dististyle, *d*, a slender curved rod, tip acute, slightly upcurved; ventral style about one-half larger than the basistyle;

a single powerful rostral spine placed far distad. Gonapophysis, *g*, nearly straight, margins smooth.

Holotype, male, Piti, Guam, at light, June 12, 1936 Swezey (BISHOP).

7. **Limonia (Dicranomyia) guttula** (Alexander) (figs. 34, 40)

Dicranomyia guttula Alexander, 1915, Canad. Ent., **47:** 80, fig. (wing).

Limonia (*Dicranomyia*) *sus* Alexander, 1950, Ann. Mag. Nat. Hist. Ser., 12, **3:** 942–943.

Limonia (*Dicranomyia*) *guttula* (Alexander), 1956, Ruwenzori Exped., 1934–35, 1, no. 7, Tipulidae, p. 202.

Type of *guttula* from Lourenco Marques, Mozambique, South East Africa; of *sus* from Hollandia, Netherlands New Guinea.

MALE: Length about 3–5 mm.; wing 4.5–6 mm.

FEMALE: Length about 4.5 mm.; wing 6 mm.

Belongs to the *punctulata* group; mesonotum brown, yellow pollinose, praescutum darker medially, pleura brown with a narrow brownish black longitudinal stripe. Legs light brown. Wings (fig. 34) grayish, along the veins with brown spots, including alternate areas over most veins, including cord, outer end of cell *1st* M_2 and marginal seams on all longitudinal veins, with a series of spots on *M* and *Cu;* axilla darkened. Venation: Sc_1 ending opposite origin of *Rs*, Sc_2 faint, placed near tip; *Rs* gently arcuated; cell *1st* M_2 very long, much exceeding all veins beyond it; *m* shorter than the arcuated basal section of M_3, *m-cu* before fork of *M*. Male hypopygium (fig. 40) with ninth tergite, *t*, transverse, posterior border with a narrow notch to form broadly obtuse lobes. Basistyle, *b*, with ventromesal lobe obtuse, with very abundant elongate setae. Dorsal dististyle, *d*, blackened, gently curved; ventral style unusually small, its area subequal to that of basistyle, rostral prolongation broadly flattened, apex obliquely truncated, before tip on lower margin with a single powerful spine, directed caudad, apex strongly curved. Gonapophysis, *g*, blackened, mesal-apical lobe small, strongly curved to the acute tip.

DISTRIBUTION: Africa (Mozambique, Madagascar, Cape Verde Islands); Ceylon; New Guinea; Mariana & Caroline IS.

S. MARIANA IS. GUAM: May 9, 1956, Clagg (BISHOP).

PALAU BABELTHAUP: Ngiwal, May 20, 1957, Sabrosky (US). KOROR: March 3, 1953, Beardsley (BISHOP). PONAPE: Agricultural Experiment Station, at light trap, Jan. 6, 1953, Gressitt (BISHOP); fragment but identification apparently correct. TRUK TON I. (Tol); light trap in native forest, Mt. Uniböt, 390 meters, Jan. 2, 1953; altitude 32 feet, Jan. 1, 1953, Gressitt (BISHOP). YAP: Hill behind Yaptown, light trap, 50 meters, Dec. 1, 1952, Gressitt (BISHOP).

8. **Limonia (Dicranomyia) leptomera** Alexander, n. sp. (fig. 41)

Belongs to the *punctulata* group; wings without spots in cell *C* or along vein *Cu;* male hypopygium with a single rostral spine, this about one-third as long as the dorsal dististyle; gonapophysis with mesal-apical lobe black,

unusually slender, nearly straight, with a single acute tooth on margin some distance from tip.

MALE: Length about 5–5.2 mm.; wing 5–5.5 mm.

FEMALE: Length about 5.5 mm.; wing 6 mm.

Rostrum brown; palpi black. Antennae brown. Head brownish gray; eyes broadly holoptic.

Pronotum dark brown. Mesonotal praescutum yellowish brown to light brown, with a single more cinnamon brown central stripe, this paler medially behind to appear divided; scutal lobes light brown, central area narrowly testaceous; scutellum testaceous yellow; postnotum infuscated. Pleura chiefly dark brown, especially above, pruinose. Halteres with stem whitened, knob slightly infuscated. Legs with fore coxae darkened, remaining pairs slightly more yellowed; trochanters brownish yellow; remainder of legs light brown. Wings tinged with gray, patterened with brown, as common in this species group, including two spots in cell *1st A*, those in cell *C* sparse or lacking; a large oval brown area at near midlength of vein *M;* remaining spots small, placed at cord, R_2, outer end of cell *1st* M_2 and tip of R_3*;* veins obscure yellow, darker in the patterned areas. Venation: Sc_1 ending slightly beyond origin of *Rs*, the latter straight, oblique, about one-fifth longer than the slightly arcuated basal section of R_{4+5}*;* cell 1st M_2 longer than distal section of M_{1+2}*; m-cu* shortly before fork of *M*.

Abdominal tergites brown, sternites more yellowed. Male hypopygium (fig. 41) with ninth tergite, *t*, relatively large, transverse, posterior border narrowly emarginate, borders thickened; setae restricted to the lobes, about 25 in number. Basistyle, *b*, slightly smaller than the ventral dististyle, ventromesal lobe obtuse, with long setae. Dorsal dististyle, *d*, only slightly curved, tip abruptly acute; ventral style with rostral prolongation slender, at near midlength with a single nearly straight spine that is slightly less than twice the rostrum beyond it or about one-third as long as the dorsal style, the spine stout, its width more than one-half the diameter of the prolongation opposite its insertion. Gonapophysis, *g*, with mesal-apical lobe unusually slender, black, nearly straight, on margin some distance removed from tip with a single acute tooth. Aedeagus with apex simple, narrowly blackened.

DISTRIBUTION: Caroline Islands.

Holotype, male (BISHOP 9779), Colonia, Ponape I., Agricultural Experiment Station, Jan. 6, 1953, Gressitt (BISHOP). Allotopotype, female (BISHOP), Jan. 20, 1953, in cacao grove, Gressitt. Paratypes, one male, with allotype; one male, SE of Nanponmal, at light, Jan. 7, 1953, Gressitt (US, BISHOP).

The numerous Oriental-Australasian species of the *punctulata* group include species that have either one or two rostral spines on the ventral dististyle of the hypopygium, the former group including the present fly and also *Limonia* (*Dicranomyia*) *neopunctulata* Alexander, *L.* (*D.*) *poli* Alexander, *L.* (*D.*) *punctulata* (de Meijere), and *L.* (*D.*) *punctulatoides* Alexander, all differing among themselves chiefly in hypopygial structure. The most similar of these species to the present fly is *punctulata* which has the rostral spine longer and more slender, being from about one-third to nearly one-half as long as the dorsal dististyle and with the gonapophyses distinctive. The wing pattern of these two flies similarly differs slightly, *punctulata* having the small darkened areas more abundant, including various markings on costa and along vein *Cu*.

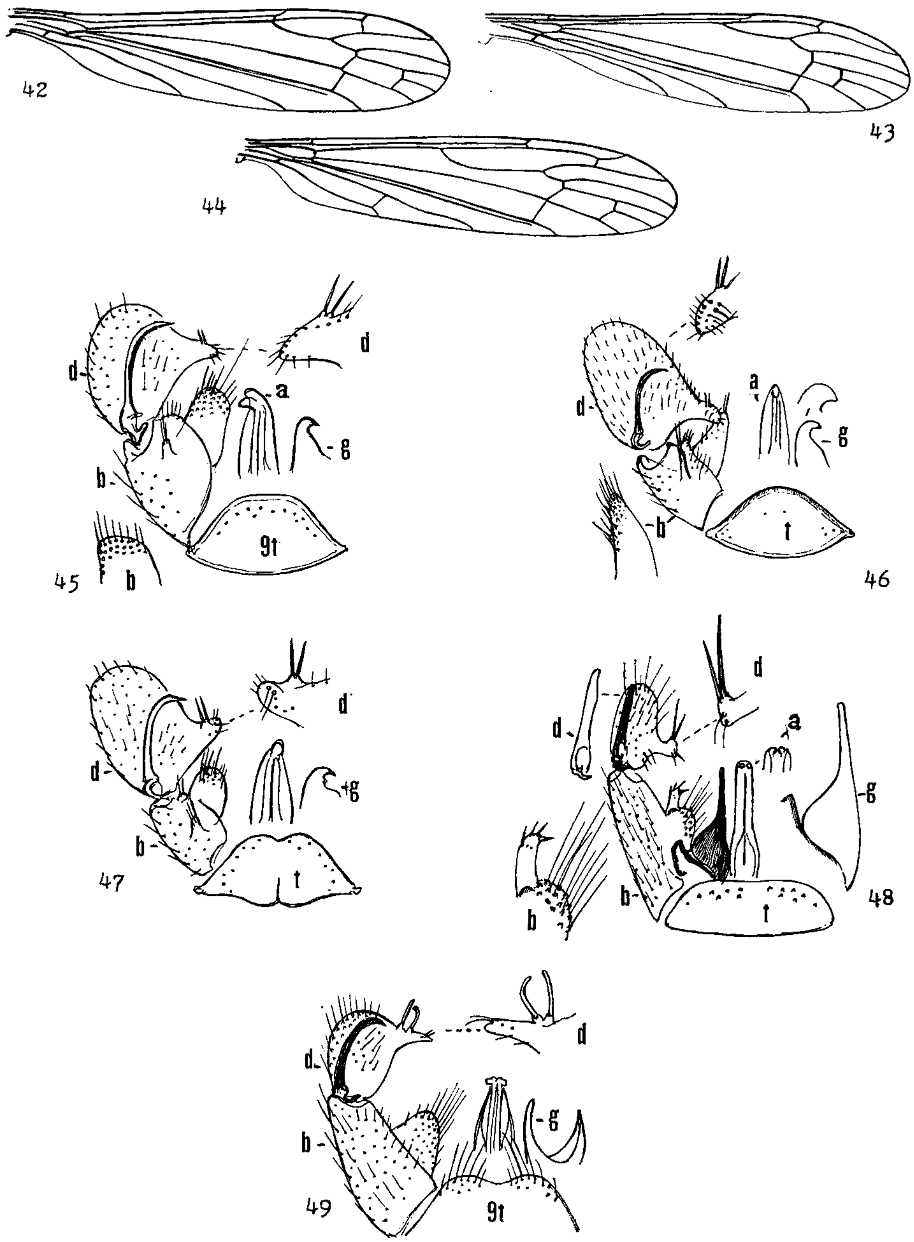

FIGURE 42–49. Genus *Limonia* Meigen; Subgenera *Dicranomyia* Stephens and *Discobola* Osten Sacken. **42.** *Limonia* (*Dicranomyia*) *basifusca* (Alexander); venation **43.** *Limonia* (*Dicranomyia*) *swezeyana* Alexander; venation **44.** *Limonia* (*Discobola*) *boninensis* Alexander, n. sp.; venation **45.** *Limonia* (*Dicranomyia*) *illingworthi* (Alexander); male hypopygium **46.** *Limonia* (*Dicranomyia*) *sordida* (Brunetti); male hypopygium **47.** *Limonia* (*Dicranomyia*) *basifusca* (Alexander); male hypopygium **48.** *Limonia* (*Dicranomyia*) *swezeyana* Alexander; male hypopygium **49.** *Limonia* (*Discobola*) *boninensis* Alexander, n. sp.; male hypopygium (Symbols: *a*, aedeagus; *b*, basistyle; *d*, dististyles; *g*, gonapophysis; *t*, ninth tergite).

C. The **tristis** group

(Species 9–11)

9. **Limonia (Dicranomyia) basifusca** (Alexander) (figs. 42, 47)

Dicranomyia basifusca Alexander, 1919, Ann. Ent. Soc. America, **12:** 328.

Limonia (Dicranomyia) basifusca: Ishida, 1957, Kenkyu Shuroku, **6:** 137.

Dicranomyia atripleura Alexander, 1919, Ann. Ent. Soc. America, **12:** 328–329.

Described from various stations in Japan, now known from Honshu, Shikoku, and Kyushu. The present materials from the Bonin Islands agree closely with Japanese specimens, differing chiefly in the slightly darker ground color of the wings.

Male: Length about 4.5–5 mm.; wing 5.5–6 mm.

Female: Length about 4.8–5.2 mm.; wing 6.4–6.8 mm.

Belongs to the *tristis* group. Rostrum, palpi and antennae black. Head dark gray; anterior vertex at narrowest point about equal to diameter of scape. Pronotum brownish gray. Mesonotal praescutum brownish gray with four vaguely indicated brown stripes; scutal lobes dark brown, median region and the scutellum paler brown; postnotum dark brown, sparsely pruinose. Pleura light brown, with a conspicuous brownish black longitudinal stripe that extends from the cervical region caudad over the propleura, dorsal anepisternum and pteropleurite onto the ventral sternopleurite. Halteres with stem obscure yellow, knobs dark brown. Legs with coxae and trochanters light yellow, remainder of legs brown; claw with a single major spine, with about three smaller denticles near base. Wings (fig. 42) strongly darkened, stigma oval, brown; darkened area at arculus more or less evident. Male hypopygium (fig. 47) with ninth tergite, *t*, transverse, narrowed posteriorly, apex shallowly notched, setae marginal, long but delicate, laterally with some setae to base. Basistyle, *b*, with a relatively small lobe on face, outer apical angle with two long setae; ventromesal lobe broad, apex obtuse. Dorsal dististyle, *d*, long and slender, apex narrowed; ventral style large, in extent about one-half greater than the basistyle, setae small and sparse; rostral prolongation small, pale, apex obtuse, slightly upturned; rostral spines small, both from summit of a single low basal tubercle. Gonapophysis, *g*, with mesal-apical lobe small, slender, curved to an acute point.

DISTRIBUTION: Bonin Islands.

BONIN IS. Chichi-jima. Ani Jima, "Commander's beach", April 22, 1958; Southwest Bay, on beach, May 17, 1958. Miyanohama, "Jack Williams beach", April 15–21, 1958. Nishi Jima, May 22, 1958. Sakai-ura, "Bull Beach", April 5–25, 1958. Tatsumi Wan, Southeast Bay, April 11–22, 1958. Yoake Yama, April 21, 1958. Haha-jima: Okimura, April 26—June 9, 1958, all Snyder (US, BISHOP, ALEX).

10. **Limonia (Dicranomyia) illingworthi** (Alexander) (figs. 45, 46)

Dicranomyia illingworthi Alexander, 1914, Ann. Ent. Soc. America, **7:** 239–240, fig. 1 (wing). fig. 7 (male hypopygium).

Limonia (Dicranomyia) illingworthi: Alexander, 1929, Encycl. Ent., Diptera, **4:** 89–90, fig. (male hypopygium); 1940, Annot. Zool. Japon., **19:** 210.

Type from Nadi, Fiji Islands, taken July 28, 1913, by J. F. Illingworth. Widely distributed in the Australasian region, including Micronesia, reaching its western limits in the Caroline Islands.

While being similar in its general appearance to *Limonia* (*Dicranomyia*) *sordida* (Brunetti), the present fly differs in hypopygial structure. The male genitalia of the two species are shown for comparison (figs. 45, 46). In *illingworthi* (fig. 45) the discal lobule of the basistyle, *b*, is small, less than twice as long as broad, tufted with strong setae, outer lobule or tubercle lacking, being represented by a concentration of four or five strong setae; ventromesal lobe of basistyle very broad, apex subtruncate, with numerous setae, those of upper angle stronger, one of these bristles being unusually long, nearly equal in length to the entire lobe. In *sordida* (fig. 46) the discal lobule of the basistyle, *b*, elongate, the length from four to five times the diameter, outer tubercle low but evident; ventromesal lobe long, tapering to the narrowly obtuse apex, the single unusually long seta being apical in position.

DISTRIBUTION: Caroline, Marshall, and Gilbert Islands.

PONAPE: Colonia (Kolonia), Jan. 17, 1938, Esaki (KU); altitude 16 meters, Jan. 11, 1953, Gressitt (BISHOP); Jan. 7, 1953, Gates Clarke (US). NANPONMAL (Nanpohnmal); light trap in native forest, Jan. 7–12, 1953, Gressitt (BISHOP). Temwetemwensekir Mt. (Tamatamansakir), 180 meters, Jan. 16, 1953, Gressitt. IFALUK: IFALUK I., Aug. 12. 1953, Marston Bates (BISHOP). KUSAIE: Mutunlik (Matanluk), 22 meters, Feb. 1, 1953, Gates Clarke (US). LAMOTREK A. and I. Feb. 5, 1953, Beardsley.

MARSHALL IS. MILI A., Alu (Nallo) I., Oct. 3, 1953, Beardsley (US). Arno A and I., Oct. 4, 1953, Beardsley. ARNO A., Ine I., May 2, 1950, sweeping *Polypodium*, Ira LaRivers (BISHOP). KILI, Oct. 2, 1953, Beardsley. NAMORIK A., Namorik I., Sept. 30, 1953, Beardsley. NAMU I. and A., Oct. 24, 1953, Beardsley. WOTJE I. and A., Nov. 24, 1937, Esaki (KU).

GILBERT IS. MAKIN (Butaritari) I., June 11, 1942, Enke (BISHOP).

11. Limonia (Dicranomyia) sordida (Brunetti) (figs. 9, 46)

Dicranomyia sordida Brunetti, 1912, Fauna British India, Diptera Nematocera, pp. 382–383.

Limonia (*Dicranomyia*) *sordida:* Alexander, 1942, Bull. B. P. Bishop Mus., **172:** 198.

Limonia (*Dicranomyia*) *tattakae* Alexander, 1923, Philippine Jour. Sci., **22:** 469–470.

Type of *sordida* from Kurseong, Eastern Himalayas, India; of *tattakae* from Tattaka, Formosa. Widespread in the Oriental region, in the Pacific

area occurring as far east as the Caroline islands where it is replaced by *illingworthi* (Alexander).

MALE: Length about 5–5.5 mm.; wing 6.5–7 mm.

FEMALE: Length about 5.5–6 mm.; wing 6–6.5 mm.

Belongs to the *tristis* group. General coloration of head and thorax gray, praescutum with three brown stripes, centers of scutal lobes brown. Legs yellowish brown. Wings (fig. 9) faintly darkened, prearcular and costal fields more yellowed; stigma small, pale brown; less evident brown clouds at arculus, origin of *Rs*, cord and outer end of cell *1st* M_2, in cases the darkened pattern pale to virtually lacking; veins brown. Venation: Sc_1 ending opposite or just beyond origin of *Rs*, Sc_2 slightly removed; *m-cu* before fork of *M*, in cases almost to its own length. Abdominal tergites medium to darker brown, sternites more yellowed. Male hypopygium (fig. 46) with posterior border of ninth tergite, *t*, convex, the cephalic margin more gently so. Basistyle, *b*, with two lobules, the discal one long and slender, outer lobe mesal in position, very small; ventromesal lobe long, narrowed outwardly, apex with few strong setae. Dorsal dististyle, *d*, a slender rod, narrowed to an acute spine; ventral style fleshy, its area about one-half greater than that of the basistyle. Gonapophysis, *g*, with mesal-apical lobe short, slightly curved at apex.

DISTRIBUTION: Mariana (Guam, Saipan) and Caroline Is. (Palau, Yap)

S. MARIANA IS. GUAM: Piti, July 13, 1924, Swezey (BISHOP). Talofofo, June 17, 1924, Swezey (BISHOP). No further data, May 9, 1956, Clagg (BISHOP). Agana, Aug. 1952, Krauss (US). SAIPAN: 1.2 miles east of Tanapag, Sep. 23, 1944, Edgar; Nov. 23, 1944—Feb. 24, July 19, 1945, Dybas (CM).

PALAU: BABELTHUAP I., Airai, Ngarsung, May 16, 1957, Sabrosky (US). Ngardmau, May 10, 1957, Sabrosky (US). Ngaremlengui, June 1–4, 1957, Sabrosky. Ngatpang (east), 65 meters, sweeping, Dec. 8, 1952, Gressitt (BISHOP). Ngerehelong, May 6–7, 1957 (Sabrosky). Babelthuap, without exact data, Dec. 22, 1947, Dybas (CM). KOROR: 25 meters, Dec. 12, 1952, light trap, Gressitt (BISHOP). April 16, 26, May 16, 1957, Sabrosky (US). Ngesebus, May 29, 1957, Sabrosky. PELELIU: Aug. 4, 7, 1945, Dybas (CM). YAP: RUMUNG, June 17, 1957, Sabrosky (US).

D. The **swezeyana** group

(Species 12)

12. **Limonia (Dicranomyia) swezeyana** Alexander (figs. 43, 48)

Limonia (Limonia) swezeyana Alexander, 1942, Insects of Guam, I, Bull. Bishop Mus., **172:** 195–196.

The types and only specimens presently known to me include the type female and a broken male, from Fadian, Guam, S. Marianas, taken September 18, 1936, by Otto Herman Swezey, to whom the species was dedicated. The specimens were reared "ex rotten bark of dug-dug".

MALE: Length about 5 mm.; wing 5.5 mm.

FEMALE: Length about 5 mm.; wing 5 mm.

Rostrum, palpi and antennae black. Head dark. Mesonotum almost uniformly medium brown, pleura paler. Halteres dark brown. Legs brown, tarsi snowy white, including the distal fourth or fifth of basitarsi and the remaining segments. Wings (fig. 43) with a strong brownish tinge, stigmal region not or scarcely darker; veins dark brown. Venation: Sc_1 ending about opposite two-fifths the length of *Rs*, Sc_2 shortly removed; free tip of Sc_2 a short distance beyond level of R_2; *m-cu* close to fork of *M*. Abdominal tergites dark brown, posterior borders slightly paler. Male hypopygium (fig. 48) with ninth tergite, *t*, transverse, lateral ends not extended, setae sparse, placed a short distance behind the posterior margin. Basistyle, *b*, with ventromesal lobe provided with long setae, on posterior face with a smaller lobe that bears four strong spinoid setae, the outermost shorter and stouter. Outer dististyle, *d*, straight, relatively stout, tip obtuse; ventral style relatively small, less than one-half the area of the basistyle; rostral prolongation with two slender spines placed close to the truncated apex, spines slightly unequal, the outer one more slender, about four-fifths the length of inner spine. Base of gonapophysis, *g*, dilated, mesal-apical lobe long, straight, narrow.

The closest allies of the present fly are the Oriental *Limonia* (*Dicranomyia*) *albitarsis* (Alexander), of Java, and *L.* (*D.*) *subalbitarsis* (Alexander), of Luzon, which have the same peculiar ventromesal lobe of the basistyle of the hypopygium but differ conspicuously in having a single rostral spine instead of two as in the present fly. All of these species originally were placed in the subgenus *Limonia* because of the lengthened subcostal vein, but more recent studies have indicated that the members of the genus having two dististyles, as in the present species, more properly are referred to *Dicranomyia*, as discussed elsewhere.

Subgenus **Discobola** Osten Sacken

Discobola Osten Sacken, 1865, Proc. Ent. Soc. Philadelphia, **4:** 226. (type: *annulata* Linnaeus, as *argus* Say)

Trochobola Osten Sacken, 1869, Mon. Diptera North America, **4:** 98 (type: *annulata* Linnaeus, as *argus* Say)

Discobola is a well-defined subgenus of *Limonia*, including approximately 30 species, chiefly in the Old World and with a concentration of forms in New Zealand. A single species presently is known from Micronesia. Several other species occur in the Oriental and Australasian Islands to the south, and in Japan and Formosa to the west, and it seems desirable to provide a list of the species of *Discobola* as presently known, indicating their distribution.

acurostris Alexander—Western China (Szechwan)

ampla (Hutton)—New Zealand

annulata (Linnaeus), including *argus* (Say), *imperialis* (Loew)—Holarctic; Oriental (Nepal, Assam); Australasian (New Guinea)

armorica Alexander—Burma, southern Tibet

australis (Skuse)—Southeastern Australia, Tasmania

boninensis Alexander, n. sp.—Micronesia (Bonin Islands)

caesarea (Osten Sacken)—Western Palaearctic
calamitas Alexander—New Guinea
caledoniae Alexander—New Caledonia
chathamica (Alexander)—New Zealand (Chatham Islands)
dicycla (Edwards)—New Zealand
dohrni (Osten Sacken)—New Zealand
epiphragmoides Edwards—Borneo
euthenia Alexander—Sikkim, Nepal
freyana Nielsen—Azore Islands
fumihalterata Alexander—Japan
gibberina Alexander, *gibbera* (Edwards), preoccupied—New Zealand
gowdeyi Alexander—West Indies (Cuba, Jamaica, Puerto Rico)
margarita (Alexander)—Eastern and southeastern Asia—Sakhalin, Korea; south to Assam, Thailand, Taiwan (Formosa)
moiwana (Alexander)—Japan
neoelegans Alexander, *elegans* (Doane), preoccupied—Western Nearctic
nigroclavata Alexander—Eastern Nearctic
parargus Edwards—Borneo
parvispinula Alexander—Japan
pictoralis Alexander, *picta* (Hutton), preoccupied—New Zealand
striata (Edwards)—New Zealand
taivanella Alexander—Taiwan (Formosa)
tesselata (Osten Sacken), *variegata* (Hutton)—New Zealand
venustula Alexander, *venusta* (Osten Sacken), preoccupied—New Zealand

The most easily noted character for recognition of the subgenus is the presence of a supernumerary crossvein between the Anal veins of the wing, the other venational features being much as in typical *Limonia.* All species presently known have conspicuously patterned wings, commonly with the darkened areas forming rings or ocelliform markings of various shapes. The structure of the male hypopygium is generally as in *Dicranomyia* or *Metalimnobia,* there being two dististyles, the rostral prolongation of the ventral style being small with the usual two spines at its base or on the adjoining body of the style, in cases, as *margarita,* the spines removed to the actual apex of the style. The spines are somewhat distinctive, appearing as stout pale rods that arise from individual basal tubercles. Other somewhat peculiar features include the phallosome, as the very long slender mesal-apical lobes of the gonapophyses and the small apical lobes of the aedeagus.

13. **Limonia** (**Discobola**) **boninensis** Alexander, n. sp. (figs. 44, 49)

Size small (wing 7 mm. or less); rostrum, head and antennae black; flagellar stegments with distinct apical pedicels; mesonotal praescutum brownish yellow with three brown stripes, the lateral pair marginal, scutellum brownish black, pleura yellow, striped longitudinally with brown; halteres dark brown; legs with femora darkened, apex and a subterminal ring pale yellow, enclosing a broader black ring; wings with the restricted ground yellow, with four broken darker crossbands, the areas nearest costa darker, in part ocelliform, Anal cells chiefly darkened; abdominal tergites dark brown; male hypopygium with tergite shallowly emar-

ginate; rostral spines near base of prolongation of ventral dististyle.

MALE: Length about 5.3–5.5 mm.; wing 6.6–7 mm.; antenna about 1.5 mm.

FEMALE: Length about 5.5 mm.; wing 6.5 mm.

Rostrum and palpi black. Antennae black throughout; flagellar segments long-oval, appearing constricted by the glabrous apical pedicels; segments with dense setulae, somewhat shorter than the longest verticils. Head dull brownish black; anterior vertex narrow, elevated, about one-third the diameter of scape.

Pronotum medium brown, more yellowed behind; pretergites whitened. Mesonotal praescutum with ground brownish yellow, with three widely separated brown stripes, the lateral pair marginal; scutal lobes dark brown, central region and posterior calli obscure yellow; scutellum brownish black, parascutella yellowed; postnotum dark brown. Pleura yellow, striped longitudinally with brown, the short dorsal stripe including the propleura and sides of the pronotum, ventral stripe including and extending from the fore coxae backwards, involving the ventral sternopleurite, central pteropleurite and pleurotergite. Halteres dark brown, including knobs, base of stem yellowed. Legs with coxae yellow, fore pair darkened; trochanters yellow; femora brown, darker outwardly, apex and a subterminal ring pale yellow, enclosing a broader black ring; tibiae obscure yellow, tips very narrowly and inconspicuously darkened; tarsi yellow; claws elongate, slender, only slightly curved, at near one-third the length with a long slender spine. Wings (fig. 44) with the restricted ground yellow, heavily patterned with brown, essentially arranged as four broken crossbands, all darker in the costal field; first band at and beyond arculus, with yellow spots beyond *h*, in bases of all included cells and at extreme tip of cell *2nd A;* second band centered at origin of *Rs*, on anterior half ocelliform, interrupted behind by a yellow spot in cell *Cu*, including cell *1st A* except narrowly at ends of the veins; third band narrower, at fork of *Sc* and before cord, solidly darkened at costa, with yellow centers in cells *R* and *M;* fourth band beyond cord, including the solid stigmal area, interrupted in the cells behind; large marginal spots on R_3, R_{4+5}, and the medial veins, the former larger; costal darkenings subequal to or narrower than the yellow interspaces; veins yellow in the ground, pale brown in the darkened areas. Longitudinal veins beyond cord with macrotrichia, lacking on *Rs* and *1st A*, present at ends of *M*, basal section of *Cu*, and *2nd A*. Venation: R_{1+2} elongate, nearly four times R_2; cell *1st* M_2 rectangular to long-rectangular, subequal to or exceeding any veins beyond it; *m-cu* at or before fork of *M*.

Abdominal tergites dark brown; sternites brownish yellow, apical margins narrowly dark brown, clearer yellow on sternites; hypopygium brownish yellow. Ovipositor with both cerci and hypovalvae acute at tips, horn-yellow, hypovalvae blackened basally. Male hypopygium (fig. 49) with ninth tergite, *t*, transverse, narrowed outwardly, posterior border shallowly emarginate, lobes low, with conspicuous setae, about 15 on either side, some longer and stronger than others. Basistyle, *b*, with ventromesal lobe relatively small, the outer more ventral setae longer. Dorsal dististyle, *d*, moderately curved, tip acute; ventral style in area slightly more than one-half the total of the basistyle; rostral prolongation with tip oblique, the spines near base. Gonapophysis, *g*, with mesal-apical lobe long and slender, nearly straight. Aedeagus at apex with two small divaricate flaps.

DISTRIBUTION: Bonin Islands.

Holotype, male (US 72331), Chichi-jima, Ototo-jima, Kammuriiwa (Southwest Bay), June 3, 1958, F. M. Snyder. Allotype, female, Anijima, Son-zan (Northeast Bay), May 28, 1958. Paratype, male, with allotype, (ALEX).

Limonia (*Discobola*) *boninensis* is most similar to *L.* (*D.*) *annulata* (Linnaeus),

differing evidently in the darkened halteres and distinctive wing pattern. The coloration of the halteres is more as in *L.* (*D.*) *fumihalterata* Alexander, which has the darkened wing pattern unusually delicate, the pale ground color exceeding the darkened areas in extent, and with sparse brown dots in cell *M.*

Subgenus **Doaneomyia** Alexander

Doaneomyia Alexander, 1921, Bull. Brooklyn Ent. Soc., **16:** 11 (type: *tahitiensis* Alexander).—Edwards, 1928, Insects of Samoa, (6) **2:** 78–79.

The subgenus *Doaneomyia* differs from all other subgeneric groups in *Limonia* in the venation, especially the complete loss of vein *2nd A* (fig. 11). As indicated by Edwards, in reference cited, the nearest relative appears to be the subgenus *Pseudoglochina* Alexander, where in certain species vein *2nd A* beyond the interanal crossvein is fused for a short to greater distance with the anal margin of the wing, reducing the length of cell *2nd A*, the maximum such reduction presently known in the subgenus being found in *Limonia* (*Pseudoglochina*) *microneura* Alexander (fig. 28), as further discussed later in the present paper.

The male hypopygium of *Doaneomyia* is much as in *Pseudoglochina*, being of the same general type that is found in the cosmopolitan subgenus *Dicranomyia.* Ninth tergite with posterior border very shallowly emarginate, the lobes with sparse very long setae. Ventromesal lobe of basistyle simple. Two dististyles, the fleshy ventral style with a short rostral prolongation that bears two approximated spinoid setae. Phallosome with mesal-apical lobe of gonapophysis a short slender spike; apex of aedeagus a single elongate lobe or blade.

No species of *Doaneomyia* presently is known from Micronesia but may be expected to occur. The species include *Limonia* (*Doaneomyia*) *fijicola* Alexander (re-naming of *fijiensis* (Alexander), 1924, preoccupied), of Fiji; *L.* (*D.*) *caledoniensis* Alexander, and *L.* (*D.*) *deprivata* Alexander, of New Caledonia; *L.* (*D.*) *altitarsis* (Edwards) of New Hebrides, and the subgenotype, *L. D.*) *tahitiensis* (Alexander), of the Society Islands. In the western Pacific, *L.* (*D.*) *pampangensis* Alexander occurs in Luzon.

Miss L. E. Cheesman (1932: 73–74) provides notes on the habits and occurrence of *tahitiensis* in Tahiti, that are quoted in part. "There is a very large Tahitian midge, indigenous to this island; and one of the most beautiful dancers. Not that its movements are really different from the other artistes; but as every joint of its legs is decorated with white bands, this gives a most distingue appearance. It is fascinating to watch these midges going through their gymnastics; and very weird to see them dancing in a dark gully when

only the white spots are visible. They have one most curious and unaccountable habit, shared with many other midges, and that is to hang upside down in cobwebs. The spiders know them quite well, and apparently make no attempt to catch them. All those that I have seen have been small spiders. But although some of the webs where they hang are sticky to the touch, yet the midges never seem to be entrapped. It is a curious habit for any insect to hang suspended in this fashion, and why they should do so in a place so fraught with danger as a spider's web is incomprehensible. On some islands there are spiders with white bands to their legs which at first sight can be mistaken for these midges, but whether the spider mimics the midge or the other way is not plain, for it is difficult to see what advantage such mimicry would be to either".

Miss Cheesman further discusses certain small species of Tipulidae that may pertain to the present fly in their relation to their swarming beneath waterfalls and in heavy rains. Their involuntary immunity to the falling drops by the action of the latter on the air and the manner in which the crane flies are protected under such situations are considered.

Subgenus **Euglochina** Alexander

Dicranomyia (*Euglochina*) Alexander, 1921, Canad. Ent., **53:** 207 (type: *saltens* Doleschall, as *cuneiformis* de Meijere)

Limonia (*Euglochina*) Alexander, 1929, Philippine Jour. Sci., **40:** 241, 243.

The subgenus *Euglochina* includes a relatively small number of species that are found throughout the tropics of the Australasian, Oriental, and Ethiopian regions.

Antennae 14-segmented; flagellar segments strongly narrowed at both ends, especially the outer, terminal segment elongate, slightly constricted at near midlength; verticils of intermediate segments very long, the extreme being nearly twice the length of segment. Halteres long, subequal to the thorax. Legs long and slender; tarsi snowy white. Wings (fig. 12) cuneiform, the base strongly narrowed, anal angle lacking, prearcular field relatively short. Venation: Arculus beyond general level of other elements of the basal cord; cord far distad, beyond two-thirds the wing length, commonly at near five-sixth to seven-eighth the wing; veins *Sc* and *2nd A* commonly subequal in length, ending some distance before the cord; *Rs* and basal section of R_{4+5} short; cell *1st* M_2 closed in regional species, in some others open by atrophy of vein *m* (as *curtata* Alexander, *invocata* Alexander, *silens* Alexander); in *projecta* with vein M_3 entirely lacking, *M* having two branches (M_{1+2} and M_4), as in the subgenus *Nealexandriaria.*

Abdomen long and slender. Male hypopygium with ninth tergite transverse, posterior border feebly emarginate. Basistyle with ventromesal lobe small, oval. Two dististyles, dorsal style with outer third gently curved, ventral style large and fleshy, its area from about 3 to 4 times that of basistyle; rostral prolongation with two widely separated spines. Apical lobes of aedeagus rounded.

14. Limonia (Euglochina) saltens (Doleschall)

Limnobia saltens Doleschall, 1857, Natuurkundig Tijdschrift voor Nederlandisch-Indie (new series), **14:** 390.

Dicranomyia saltans Osten Sacken, 1882, Berlin. Ent. Zeitschr., **26:** 88.—Brunetti, 1912, Fauna British India, Diptera Nematocera, p. 373.

Dicranomyia saltens Edwards, 1911, Ann. Mag. Nat. Hist. Sers., **8:** 8: 58–59.

Dicranomyia cuneiformis de Meijere, 1911, Tijdsch. Ent., **54:** 23–24.

The species has a wide distribution in the Oriental region, Ceylon, Taiwan (Formosa), Philippines, Java, Sumatra. The present records are the first from the Australasian region.

Male: Length about 5.5–7 mm.; wing 6–9 mm.

Female: Length about 6–6.5 mm.; wing 5–7 mm.

Rostrum brown, palpi black. Antennae with scape and pedicel brown, flagellum brownish black. Head brown.

Anterior thoracic dorsum brown, posterior sclerites and pleura yellowed, praescutal stripes poorly delimited. Halteres with stem yellow, the large knob dark brown. Legs brown, outer tarsal segments snowy white, including distal ends of basitarsi and the remaining segments. Wings tinged with brown, the large oval stigma darker brown, its anterior end reaching base of *Rs;* veins darker brown; longitudinal veins beyond cord with coarse black trichia. Venation: Apices of veins Sc_1 and *2nd A* in approximate transverse alignment; *Rs* end basal section of R_{4+5} subequal, gently arcuated; cell *1st* M_2 ranging from short-rectangular to slightly longer, usually shorter than the veins beyond it, in cases subequal to these veins or slightly longer; *m-cu* at from about one-third to two-thirds M_{3+4}. Abdomen brown.

PALAU: Babelthuap: Melekeiok, May 24, 1957, Sabrosky (US). Ngerehelong, May 7, 1957, Sabrosky.

Doleschall's record of the occurrence of the type specimens of *saltens* in Java, as quoted by Osten Sacken (1882: 88) are of interest. "Very numerous in the season of the dry monsoon; found often in dwellings, principally in the corners, occurring in large numbers, seeming to form a regular chain while dancing in the air, so close together as to appear to hold one another". Comparable observations on the occurrence of crane flies on spider webs have been made for several species in the subgenus *Thrypticomyia* Skuse and are discussed under that group later in the present report.

Subgenus **Geranomyia** Haliday

Geranomyia Haliday, 1833, Ent. Mag. (London), **1:** 154, (type: *unicolor* Haliday)

Limnobiorhynchus Westwood, 1835, Ann. Soc. Ent. France, **4:** 683, (type: *brasiliensis* Westwood, in part)

Aporosa Macquart, 1839, in Webb et Berthelot, Hist. nat. des Iles Canaries, Entomol., Diptera, p. 100, (type: *canariensis* Bergroth, as *maculipennis* Macquart)

Plettusa Philippi, 1865, Verh. zool. bot. Ges. Wien, **15:** 597, (type: *valida* Loew, as *virescens* Philippi)

Triphana Skuse, 1890, preprint 1889, Proc. Linn. Soc. New South Wales, 2, **4:** 777, (type: *lutulenta* Skuse)

Tetraphana Skuse, 1890, preprint 1889, Proc. Linn. Soc. New South Wales, 2, **4:** 778, 780, (type: *skuseana* Alexander, as *fusca* Skuse, preoccupied)

Monophana Edwards, 1912, Trans. Linn. Soc. London, 2, 15, Zool., p. 200, (type: *edwardsella* Alexander, as *immaculata* Edwards, preoccupied)

Parageranomyia Santos Abreu, 1923, Mem. R. Acad. Cien. y Artes Barcelona, **18:** 68, (type: *palmensis* Santos Abreu)

Pseudaporosa Alexander, 1924, Ann. Mag. Nat. Hist. Ser., 9 **13:** 177, (type: *circipunctata* Brunetti, as *venustithorax* Alexander)

Proaporosa Alexander, 1922, Proc. Linn. Soc. New South Wales, **47:** 582, (lapsus for *Pseudaporosa*)

To all intents *Geranomyia* essentially is a *Dicranomyia* with elongated mouthparts, the other features, including the venation and hypopygial structure, being much the same in both groups. As discussed earlier under the generic account, the length of the rostrum in the present subgenus shows a great range in the various species, in some, as *Limonia* (*Geranomyia*) *townsendi* (Alexander), of Peru, being virtually as long as the entire body. The usual length is about one-half the body, while the greatest reduction is found in species such as *L.* (*D.*) *circipunctata* Brunetti, Oriental-Australasian in distribution, where the rostrum is approximately equal in length to the remainder of the head. In venation *Geranomyia* likewise is virtually as in *Dicranomyia* with vein *Sc* varying from short to very long in different species and with cell *1st* M_2 generally closed while being open in certain isolated species. The presence of a supernumerary crossvein at near midlength of cell *Sc* appears to be a constant character throughout the subgenus.

The male hypopygium agrees closely with that of *Dicranomyia*, differing in minor regards only. For a detailed consideration of the hypopygium in *Geranomyia*, two papers are suggested (Alexander, Rev. Ecuat. Ent. Par., 1953, **1:** 77–95, figs. 1–9; Ibid., 1954, **2:** 51–67, figs. 10–32).

The majority of the known species of *Geranomyia* occur in the Neotropical region (about 145), with fewer in the Oriental (about 65).

15. **Limonia (Geranomyia) aeruginosa** Alexander, n. sp. (figs. 50, 54)

General coloration of mesonotum varying from fulvous to polished black; rostrum with labial palpi long and slender; halteres and legs yellow; wings narrow, faintly tinged with yellow, stigma small, pale brown, *Sc* long; male hypopygium with rostral spines moderately long, from a low common tubercle; outer end of mesal-apical lobe of gonapophysis with microscopic setulae.

MALE: Length, excluding rostrum, about 5 mm.; wing 4.7–4.8 mm.; rostrum about 2.5–3 mm.

Rostrum reddish brown, moderately long, labial palpi long and slender, divergent, separated back to level of insertion of maxillary palpi; labrum about two-thirds as long as labial palpus, slightly stouter. Antennae brown, shorter than the labial palpi; flagellar segments oval, longer than the verticils. Head blue gray; anterior vertex narrow.

Pronotum obscure yellow. Mesonotum dark fulvous to polished black (in paratype), pleura fulvous, patterned with yellow on propleura and pteropleurite. Halteres pale yellow. Legs yellow; claws small, nearly straight, almost the basal half with teeth, the outer three extended into hairlike points, the four small basal ones darker, obtuse. Wings (fig. 50) narrow, faintly tinged with yellow, stigma pale brown, small and indistinct; veins light brown. Longitudinal veins beyond general level of origin of *Rs* with macrotrichia, lacking on *Sc* and both Anals. Venation: outer part of costa incrassated; *Sc* relatively long, Sc_1 ending about opposite three-fourths *Rs*, Sc_2 slightly removed; *Rs* about twice the basal section of R_{4+5}; outer radial branches slightly convergent outwardly, cell R_3 narrowest at margin; cell *1st* M_2 rectangular, slightly longer than vein M_3; *m-cu* about its length beyond fork of *M;* Anal veins beyond the interanal crossvein gently convergent, cell *2nd A* narrow.

Abdominal tergites fulvous, sternites more yellowed. Male hypygium (fig. 54) with ventral dististyle, *d*, large and fleshy, in area exceeding three times the basistyle; rostral prolongation small, rostral spines at summit of a single low tubercle, each spine about one-half longer than the rostrum beyond the tubercle; dorsal dististyle a long slender curved sickle, outer end narrowed very gradually to the acute tip. Gonapophysis, *g*, with mesal-apical lobe a nearly straight horn, narrowed to the acute apex, outer third with scattered setulae. Aedeagus terminating in two narrow lobes, their tips acute.

Paratypes became available after the holotype was described. Rostrum slightly longer than in type (as shown by measurements). Mesonotal praescutum and scutum polished black, sides of praescutum with a large circular more intensely black area, bordered by a more nacreous semicircular line; posterior margins of scutal lobes obscure yellow, scutellum dull black, parascutella obscure fulvous; postnotum black, sparsely pruinose. Pleura yellow, anepisternum and ventral sternopleurite slightly darker, more fulvous, pteropleurite silvery white pruinose. The very different body coloration may be caused by the maturity of the specimens or perhaps to individual normal variation. Because of the great similarity of venation and hypopygial characters I consider these specimens to represent a single species.

DISTRIBUTION: W. CAROLINE IS.

Holotype, male (US 72332), PALAU. Babelthuap, East Ngatpang, altitude 65 meters, in light trap, Dec. 9, 1952, Gressitt. Paratypes, one male, Ngerkabesang, Babel., May 13, 1957, Sabrosky (US); one male, Malakal, Palau, Sep. 1952, Krauss (BISHOP).

The present fly is very close to *Limonia* (*Geranomyia*) *argentifera* (de Meijere), known from Java, Philippines, and Formosa, and with more materials may be found to represent this species.

16. Limonia (**Geranomyia**) **dybasi** Alexander, n. sp. (figs. 14, 51, 55, 56)

Belongs to the *conjurata* group; flagellar segments with apices strongly narrowed, bases less so, verticils long; legs brown, claws simple; wings faintly suffused, with four darker brown costal areas that are subequal in extent to the interspaces, vein R_1 between the free tip of Sc_2 and

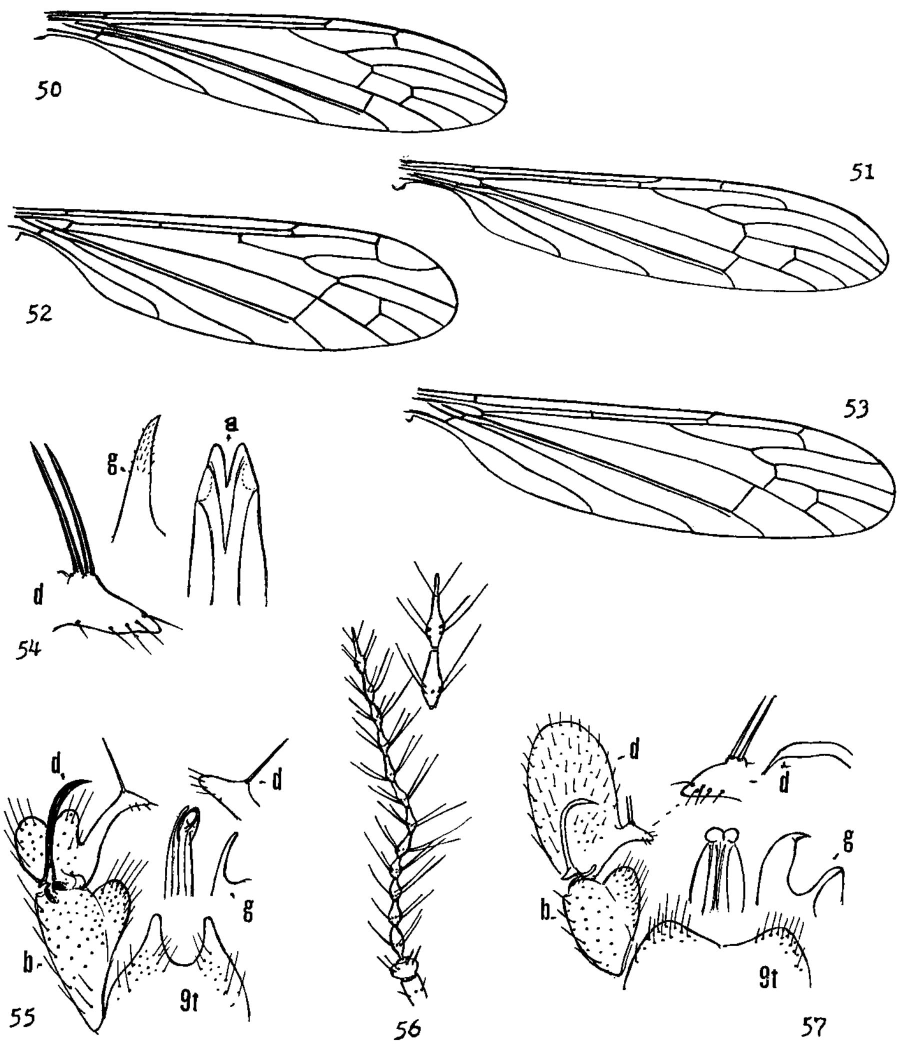

FIGURE 50–57. Genus *Limonia* Meigen; Subgenus *Geranomyia* Haliday. **50.** *Limonia* (*Geranomyia*) *aeruginosa* Alexander, n. sp.; venation **51.** *Limonia* (*Geranomyia*) *dybasi* Alexander, n. sp.; venation **52.** *Limonia* (*Geranomyia*) *palauensis* Alexander, n. sp.; venation **53.** *Limonia* (*Geranomyia*) *snyderi* Alexander, n. sp.; venation **54.** *Limonia* (*Geranomyia*) *aeruginosa* Alexander, n. sp.; male hypopygium **55.** *Limonia* (*Geranomyia*) *dybasi* Alexander, n. sp.; male hypopygium **56.** *Limonia* (*Geranomyia*) *dybasi* Alexander, n. sp.; antenna **57.** *Limonia* (*Geranomyia*) *snyderi* Alexander, n. sp.; male hypopygium (Symbols: *a*, aedeagus; *b*, basistyle; *d*, dististyles; *g*, gonapophysis; *t*, ninth tergite).

R_2 long to very long; male hypopygium with ventral dististyle small, deeply bilobed, rostral prolongation long and narrow, with a single very long spine; gonapophysis with mesal-apical lobe slender, long and straight.

MALE: Length, excluding rostrum, about 5.5–6 mm.; wing 6.5–8.2 mm.; rostrum about 1.4–1.7 mm.

FEMALE: Length, excluding rostrum, about 7–7.5 mm.; wing 8 mm.; rostrum about 2 mm.

Rostrum moderately long, about one-fourth the wing, light brown; basal segment of labial palpus very long, terminal segment short and pale. Antennae (fig. 56) with scape and pedicel brown, flagellum black; flagellar segments strongly nodulose, basal enlargements large, tapering outwardly into long necks, bases less evidently narrowed; verticils very long and conspicuous; apex of terminal segment pointed. Head above uniformly dark gray; anterior vertex narrow, less than half the diameter of scape.

Pronotum and cervical sclerites brownish black. Mesonotal praescutum with the restricted ground reddish brown, with a broad central brown to brownish black stripe that is more expanded at anterior end, lateral areas complex, including a gray sublateral stripe that is encircled by intense black, the lateral part of this enclosing a longitudinal silvery line, humeral region more yellowed; scutal lobes solidly blackened, median area more testaceous; scutellum and postnotum black, pleurotergite slightly more pruinose. Pleura dark brown, dorsal propleura with a small black spot, posterior pleurites paler. Halteres dusky, base of stem very indistinctly pale, apex of knob darker. Legs with coxae dark brown, trochanters more brownish yellow; femora light brown, extreme tips slightly darker; tibiae and tarsi brown, outer tarsal segments darker; claws elongate, simple. Wings (figs. 14, 51) faintly suffused, prearcular and costal fields more yellowed; a series of four darker brown costal areas, subequal in extent to the interspaces, chiefly in cell *Sc*, becoming fainter in cell *C*, the first area beyond *h*, second at the subcostal crossvein, third at tip of Sc_1 and base of *Rs*, fourth area at free tip of Sc_2; stigma pale to scarcely evident; very vague indications of darkenings at cord, along *Cu*, and the tip of vein *2nd A;* veins dark brown, yellow in the costal interspaces. Veins beyond level of fork of *Rs* with macrotrichia, none on *Rs*, *M* or Anals, a few near outer end of basal section of vein Cu_1. Venation: *Sc* short, Sc_1 ending slightly beyond origin of *Rs*, Sc_2 before this point, free tip of Sc_2 about opposite one-third the basal section of R_{4+5}; vein R_1 between free tip of Sc_2 and R_2 long to very long, in the extreme case only a little shorter than R_{2+3} and subequal to or slightly longer than *Rs; m-cu* longer than distal section of Cu_1, variable in position, from at or close to fork of *M* to about one-fourth its length beyond this fork. In the allotype female *Sc* is longer, with both Sc_1 and Sc_2 beyond origin of *Rs*. One wing of a paratype female has cell M_2 open by atrophy of *m*, the opposite wing normal.

Abdominal tergites of male chiefly dark brown, beyond the second the posterior borders narrowly brownish yellow; sternites more yellowed, especially laterally, outer sternites with posterior borders gray; hypopygium dark brown. In female, abdomen more extensively dark brown, including the genital shield. Ovipositor with cerci long and slender, blackened basally, gently upcurved to the acute tips, hypovalvae longer, straight. Male hypopygium (fig. 55) with ninth tergite, *t*, narrowed outwardly, posterior border with a broad U-shaped emargination, lateral lobes slender, narrowed into flattened glabrous blades, tips obtuse. Basistyle, *b*, with ventromesal lobe large. Dorsal dististyle, *d*, slender, tip acute; ventral style small, the total area about two-thirds that of the basistyle; body of style deeply bilobed, the inner lobe slightly smaller, setae of outer lobe longer; rostral prolongation long and narrow, with a single very long straight spine, about three-fifths as long as the dorsal style. Gonapophysis, *g*, with mesal-apical lobe black, long and straight, narrow. Aedeagus slender.

DISTRIBUTION: W. Caroline Is.

Holotype, male FM (CM), Peleliu I., Palau Is., July 31, 1945, at light, (Dybas) Lot 2348, CM. Allotopotype, female, with type. Paratypes, male and female, Babelthuap I., Ngiwal, May 19, 1957, at light, Sabrosky (US); male, Koror, April 1–2, 1953, at light, Beardsley (BISHOP); male, Yap Is., Rumung I., June 17, 1957, Sabrosky (US).

The species is named for the collector, Henry S. Dybas, who added materially to our knowledge of the insect fauna of western Micronesia.

The *conjurata* group, to which the present fly belongs, includes three known species, distributed from western Micronesia to eastern Australia. The essential characters of the group are found in the rostrum, especially the labial palpi, antennae, venation, including the retracted position of the free tip of Sc_2, and the male hypopygium, particularly the tergite and rostral prolongation of the ventral dististyle. The typical species, *Limonia* (*Geranomyia*) *conjurata* Alexander (1937) was described from the Barrington Tops, New South Wales, and *L.* (*G.*) *conjuratoides* Alexander (1945) from New Caledonia and North Queensland. *L.* (*G.*) *sakaguchii* (Alexander), from Okinawa, Ryukyu Islands, somewhat resembles members of this group but has the hypopygial structure distinct, especially the tergite and ventral dististyle.

17. **Limonia** (**Geranomyia**) **palauensis** Alexander, n. sp. (fig. 52)

General coloration fulvous yellow; rostrum relatively short, tip pale, the recurved part of labial palpi short; halteres brown; legs obscure yellow; wings whitish subhyaline, patterned with brown, including six solidly darkened costal areas, without interpolated spots in cells; *Sc* long, *m-cu* near fork of *M;* abdomen fulvous, posterior borders of tergites more silvery.

FEMALE: Length, excluding rostrum, about 6.8–7 mm.; wing 5.8–6 mm.; rostrum about 2–2.2 mm.

Rostrum relatively short, dark brown basally, in holotype the outer third more yellowed, including the unusually short recurved tips of the labial palpi, in paratype rostrum more uniformly darkened. Antennae nearly two-thirds as long as rostrum, medium brown; flagellar segments long-oval, longer than the verticils or the whitened pubescence. Head dark gray, especially behind eyes; anterior vertex very narrow.

Pronotum brownish yellow. Mesonotum chiefly fulvous yellow to cinnamon, praescutum with three poorly indicated yellow stripes, postnotum sparsely gray pruinose. Pleura fulvous yellow. Halteres medium brown, base of stem yellowed. Legs with coxae and trochanters yellow; remainder of legs obscure yellow, unpatterned; claw with a major outer spine, with three progressively smaller basal spinules. Wings (fig. 52) whitish subhyaline, patterned with brown, including six solidly darkened costal areas, the first over the supernumerary crossvein in cell *Sc*, second at origin of *Rs*, not reaching *M* behind, third area at fork of *Sc*, not connected with a circular darkening at fork of *Rs;* outer areas larger, including the stigma and ends of radial veins, the last one including the wing apex; narrower brown seams over cord and outer end of cell *1st* M_2; brown spots at ends of *Cu* and both Anal veins, the one at *2nd A* large and conspicuous; a small arcular darkening that does not involve cell *C;* no interpolated dots in cells; veins light brown, slightly deeper in the costal darkenings. Venation: *Sc* long, Sc_1 ending about opposite seven-eighths *Rs*, Sc_2 near its tip; supernumerary crossvein in cell *Sc* conspicuous; cell *1st* M_2 slightly widened outwardly, longer than vein M_4; *m-cu* at or immediately before

fork of *M;* Anal veins generally parallel to one another or only slightly divergent except at outer ends.

Abdominal tergites fulvous, posterior borders broadly more silvery yellow; sternites more uniformly yellow.

DISTRIBUTION: W. Caroline Is. (Palau Is).

Holotype, female (US 72333), Babelthuap I., E. Ngatpang, altitude 65 meters, at light, Dec. 9, 1952, Gressitt. Paratype, female, Babelthuap, Ngaremblengui, June 1, 1957, Sabrosky (US).

The most similar regional species include *Limonia* (*Geranomyia*) *alpestris* Alexander, of Formosa; *L.* (*G.*) *avocetta* (Alexander), Japan; *L.* (*G.*) *immobilis* Alexander, Mindanao; *L.* (*G.*) *javanica* (Alexander), Java; and *L.* (*G.*) *unifilosa* Alexander, Formosa. All of these differ from the present fly and among themselves in details of coloration of the body, legs and wings and, where this is known, in hypopygial structure.

18. **Limonia** (**Geranomyia**) **snyderi** Alexander, n. sp. (figs. 53, 57)

Mesonotum with praescutum polished brown, with three brownish black stripes, the central one divided posteriorly, pleura light yellow, with a dorsolongitudinal brownish stripe; legs whitish yellow, tips of tibiae conspicuously black; wings tinged with pale brown, restrictedly patterned with darker brown, including the stigma and three small spots in cell *Sc;* vein *Sc* long, *m-cu* shortly before fork of *M;* male hypopygium with rostral spines of ventral dististyle straight, from a short common tubercle; mesal-apical lobe of gonapophysis extended into an acute spine.

MALE: Length, excluding rostrum, about 5.5 mm.; wing 5.8 mm.; rostrum about 2 mm.

FEMALE: Length, excluding rostrum, about 7 mm.; wing 7 mm.; rostrum about 2.5 mm.

Rostrum brown, less than one-half the length of wing. Antennae with scape and pedicel obscure yellow to brownish yellow, flagellum black; basal flagellar segments short-oval, outer ones smaller but scarcely more lengthened; terminal segment slightly exceeding the penultimate; verticils short. Head dark leaden gray, the relatively broad anterior vertex clearer gray.

Pronotum above dark gray, sides and the pretergites yellow. Mesonotal praescutum polished, with three brownish black stripes, the central one divided behind, interspaces brown, humeral region more yellowed; scutal lobes solidly brownish black, median region and posterior callosities more yellowed; scutellum broad, dark brown, base slightly paler; postnotum dark brown. Pleura beneath chiefly light yellow, dorsally with a brownish longitudinal stripe, more evident in female. Halteres dark brown, base of stem restrictedly yellowed. Legs with all coxae and trochanters yellow, tinted with green; femora obscure yellow, tips narrowly darkened; tibiae obscure whitish yellow, apices more broadly and conspicuously blackened; tarsi with proximal three segments yellowish white, outer segments black. Wings (fig. 53) tinged with pale brown, prearcular region and cell *Sc* slightly more yellowed; a very restricted dark brown pattern that includes the stigma and three smaller spots that are placed at the supernumerary crossvein in cell *Sc*, above origin of *Rs*, and at fork of *Sc;* veins light brown, slightly darker in the costal markings. Longitudinal veins beyond cord with macrotrichia, including also *Rs* and extreme tip of *2nd A*. Venation: *Sc* long, Sc_1 ending about opposite midlength of *Rs*, Sc_2 slightly removed; free tip of Sc_2 slightly proximad of R_2; cell *1st* M_2 subequal to or a little shorter than distal section of M_{1+2}; *m-cu* shortly before fork of *M*.

Abdominal tergites dark brown, sternites yellowed. Ovipositor with cerci elongate, very slender, nearly straight. Male hypopygium (fig. 57) with ninth tergite, *t*, transverse, posterior

border shallowly emarginate, lateral lobes low, with numerous long setae. Basistyle, *b*, with apex darkened, ventromesal lobe relatively large. Dorsal dististyle, *d*, a slender rod, strongly curved beyond midlength, tip acute; ventral style large, its area exceeding twice that of the basistyle; rostral prolongation small, the two spines from a low common tubercle, slightly longer than the apex of prolongation beyond. Gonapophysis, *g*, pale, apex of mesal-apical lobe an acute spine. Aedeagus relatively broad, terminating in two rounded lobes.

DISTRIBUTION: Bonin Islands.

Holotype, male (US 72334), Chichi-jima Gr., Anijima, Sen-zan, Northeast Bay, May 28, 1958, Snyder. Allotype, female (US), Chichi-jima, Yatsuse River, Minatoko, Gen's Beach, April 10–22, 1958 Snyder.

The species is named for Fred M. Snyder who collected several new and rare crane flies in the Bonin Islands. From other regional species with darkened thoracic pattern and having patterned wings with vein *Sc* long, the present fly is well distinguished by the details of coloration, including the blackened tips of the tibiae, and in hypopygial structure, particularly the ventral dististyles and gonapophyses. The most similar such species include *Limonia* (*Geranomyia*) *atrostriata* (Edwards), of Formosa; *L.* (*G.*) *bifidaria* Alexander, Luzon; *L.* (*G.*) *fletcheri* (Edwards), Ceylon, India; *L.* (*G.*) *gifuensis* Alexander, Japan, Korea; *L.* (*G.*) *offirmata* Alexander, India; and *L.* (*G.*) *sorbillans* (Wiedemann), Sumatra.

18A. Limonia (Geranomyia) snyderi chichiensis Alexander, n. subsp.

FEMALE: Length, excluding rostrum about 8.5 mm.; wing 8 mm.; rostrum about 2.2 mm.

Characters as in the typical subspecies, differing as follows: Size larger, the rostrum proportionately shorter. Antennae with flagellar segments short-oval, terminal one a little longer than the penultimate, narrowed outwardly. Praescutal stripes confluent, forming a solidly blackened shield. Pleura almost uniformly brownish black, including the mesepisternum. Wings with darkened pattern more extensive, including the subcostal marks, with further darkened clouds at near midlength of *Rs* and tip of vein R_3.

Holotype, female (US 72335), Bonin Is., Chichi-jima Gr., Omura, "camp beach", April 2–25, 1958, Snyder.

Subgenus **Goniodineura** van der Wulp

Goniodineura van der Wulp, 1895, Tijdschr. Ent., **38:** 37 (type: *nigriceps* van der Wulp)

Libnotes (*Goniodineura*) Edwards, 1928, Jour. Fed. Malay States Mus., **14:** 74–79

Limonia (*Goniodineura*) Alexander, 1929, Philippine Jour. Sci., **40:** 243, 246.

Goniodineura was proposed by van der Wulp for the single species, *nigriceps*, collected in Java by Marinus Cornelis Piepers. After being maintained as a weak genus, it was placed with *Libnotes* by Edwards and later as a subgenus of *Limonia* by Alexander, as presently recognized. In his discussion of the

group, Edwards included with *Goniodineura* three further species, *fijiensis* (Alexander), *toxopei* (Edwards), and *veitchiana* (Edwards) that are here placed in a new subgenus, *Metalibnotes*, discussed later. The venation of *Goniodineura* and *Metalibnotes* is generally similar but the hypopygial structure in the two groups is quite distinct.

The venation of the type species, *nigriceps*, shows the bases of veins *Rs* and R_{2+3} rectangular, suggesting the subgeneric name, but this feature seems virtually to be restricted to this single species, especially the latter character. Further venational matters of importance are discussed and shown (figs. 15, 58–60). Vein *Sc* long, Sc_1 ending opposite or beyond the fork of *Rs*, Sc_2 removed, Sc_1 commonly being more than one-half as long as *Rs*; free tip of Sc_1 and R_2 in transverse alignment. In *nigriceps*, *r-m* is at or close to fork of *Rs* that is in longitudinal alignment with R_{4+5}; in other species R_{2+3} originates some distance before *r-m*, leaving a long basal section of R_{4+5}. *Rs* long, exceeding cell 1*st* M_2 in length, the outer veins not or only slightly decurved, contrasting with a common condition in the subgenus *Libnotes; m-cu* at or shortly beyond fork of *M*, the distance to about one-third its length or less. Anal veins at origin parallel to one another or slightly divergent, not converging as in *Libnotes* (compare figs. 15 and 19).

Male hypopygium (figs. 63, 64) with the ninth tergite and the dististyles generally as in *Dicranomyia* but differing in certain important details. Ninth tergite, *t*, transverse, posterior lateral angles extended into slender points; posterior border broadly emarginate, the lobes with several unusually long and conspicuous setae. Proctiger on either side with about ten long marginal setae. Basistyle, *b*, with lower face of ventromesal lobe with very long setae. Dististyles, *d*, two, dorsal style slender, outwardly curved, terminating in a long spine; ventral style large and fleshy, from about two and one half to three times larger than the basistyle, in some cases even larger; rostral prolongation unusually small, with two very unequal spinoid setae, the outer one strong, blackened, the inner spine very delicate, only slightly differentiated from the normal setae of the prolongation. Gonapophysis, *g*, with mesal-apical lobe long, gently curved, lower margin with sparse scattered microscopic points. Aedeagus, *a*, long, lateral flanges narrow, at apex with two lobes.

Goniodineura as here defined has numerous species in the Oriental and Australasian regions, that are listed herewith.

Oriental species

acrophaea Alexander—Philippines
banahaoensis Alexander—Philippines
bellula Alexander—Philippines
circumscripta Alexander—Philippines
claudia Alexander—Java

clitelligera Alexander—Taiwan (Formosa)
familiaris (Osten Sacken)—Philippines
forcipata (de Meijere)—Java
hassenana Alexander—Taiwan (Formosa)
imbellis Alexander—Taiwan (Formosa)
immetata Alexander—Taiwan (Formosa)
indica (Brunetti)—India
lantauensis Alexander—China
luteithorax Alexander—Java
magnisiva Alexander—India
melancholica Alexander—Philippines
montivagans (Alexander)—Java
neofamiliaris Alexander—Philippines
nepalica Alexander—Nepal
nigriceps (van der Wulp)—Java
nigricornis (Alexander)—Java
perparvula Alexander—Philippines
perparvuloides Alexander—Taiwan (Formosa)
rarissima Alexander—Philippines
signaticollis (van der Wulp)—Java
siva Alexander (re-naming of *trimaculata* Brunetti, preoccupied)—India
subfamiliaris Alexander—Philippines
unistriolata Alexander—Philippines
viridula (Alexander)—Taiwan (Formosa)

Australasian species

ephippiata Alexander—Solomon Is.
erythromera Alexander—New Britain
hopkinsi (Edwards)—Samoa
lachrimula Alexander—Fiji
novaebrittanicae Alexander—New Britain
parvistigma (Alexander)—Queensland
veitchi Alexander—Fiji

19. **Limonia (Goniodineura) delicatior** Alexander

Limonia (*Libnotes*) *delicatior* Alexander, 1940, Annot. Zool. Japon., **19:** 204–205, fig. 3 (venation), fig. 15 (male hypopygium).

MALE: Length about 5 mm.; wing 5.2 mm.

General coloration pale orange yellow, thorax and abdomen unpatterned. Head brownish black; antennae yellow to brownish yellow. Legs pale yellow. Wings subhyaline, with a very restricted pale brown pattern; *Rs* longer than R_{2+3}, nearly rectangular at origin; *m-cu* about one-half its length beyond fork of *M*. Male hypopygium with posterior border of ninth tergite shallowly emarginate; ventral dististyle with outer rostral spine much stouter than the hairlike inner one. Gonapophysis with concave margin of mesal-apical lobe with about eight or nine coarse teeth.

DISTRIBUTION: Caroline Is (Ponape).

PONAPE: Kolonia-Nat, Nov. 19, 1937, Esaki (KU).

20. **Limonia (Goniodineura) nesopicta** (Alexander) (fig. 63)

Libnotes picta Alexander, 1915, Canad. Ent., **47:** 80–82, fig. (wing); name

preoccupied by *Limonia* (*Geranomyia*) *picta* (Skuse), 1890, preprint 1889, Proc. Linn. Soc. New South Wales, **4:** 778; also by *Limonia* (*Discobola*) *picta* (Hutton), 1900, Trans. New Zealand Inst., 32, for 1899: 37.

Limonia (*Libnotes*) *nesopicta* Alexander, 1940, Annot. Zool. Japon., **19:** 204 (re-naming of *picta*, preoccupied).

MALE: Length about 6—6.5 mm.; wing about 7—8 mm.

FEMALE: Length about 6.5 mm.; wing about 7 mm.

Rostrum dark brown, palpi brownish black to black. Antennae with scape and pedicel brownish black, proximal flagellar segments light brown, outer ones paling to yellow; flagellar segments oval. Head gray; anterior vertex greatly reduced, appearing as a capillary strip to being virtually obliterated by approximation of the large eyes.

Thorax light yellow, mesonotum with conspicuous dark brown to brownish black markings, including a transverse row of four spots at near midlength of praescutum, the intermediate pair smaller, contiguous at midline, lateral area slightly larger, far removed from the margin, each scutal lobe with a comparable darkened area; posterior half of scutellum brownish black; disk of mediotergite with two pale brown lines. Halteres light yellow, apices of knobs vaguely more darkened. Legs yellow, tips of femora and tibiae dark brown, the former broader, outer tarsal segments brown; claws long and slender, each with a long spine at near one-third the length, with two smaller more basal stubs. Wings pale yellow, prearcular and costal fields more saturated yellow; a restricted brown pattern that includes a larger area at arculus, origin of *Rs* and stigma, with narrower seams over cord and outer end of cell *1st* M_2, with still more reduced darkenings at Sc_2 and outer ends of veins R_{2+3} to *2nd A;* wing tip narrowly darkened; veins light yellow, brown in the patterned areas. Venation: Sc_1 ending shortly beyond level of *r-m*, Sc_2 far retracted, Sc_1 alone more than one-half *Rs;* vein R_{2+3} moderately elevated at origin, R_{4+5} in longitudinal alignment with *Rs;* cell *1st* M_2 long-rectangular, about twice vein M_4; *m-cu* about one-half its length beyond fork of *M*, slightly longer than distal section of Cu_1.

Abdomen dull orange, basal sternites more yellowed. Male hypopygium (fig. 63) as in the subgenus. Ninth tergite, *t*, transverse, posterior border with two broad lobes, each with a concentration of about 15 long setae. Basistyle, *b*, with ventromesal lobe small, basal in position. Dorsal dististyle, *d*, a gently curved rod that narrows very gradually into a long terminal spine; ventral style large and fleshy, its area nearly twice that of basistyle; rostral prolongation short, with two unequal spines, as usual in the subgenus, the outer blackened spine stout, about as long as the prolongation, second spine more yellowed, subequal in length but slender and inconspicuous. Gonapophysis, *g*, with mesal-apical lobe slender, lower margin with microscopic points.

DISTRIBUTION: Mariana Is. (Guam, Rota, Saipan).

GUAM I: collected by D. T. Fullaway, without further data; type, male (BISHOP; No. 1226). Piti, Nov. 3, 1936, at light, Swezey (BISHOP). ROTA: Sonson-Sabana, Nov. 7, 1937, Esaki (KU) (see Alexander, 1940, pp. 204–205). SAIPAN: 1.2 miles east of Tanapag, Nov. 29, Dec. 18–25, 1944, Dybas FM (CM).

21. Limonia (Goniodineura) phaeonota Alexander

Limonia (*Libnotes*) *phaeonota* Alexander, 1940, Annot. Zool. Japon., **19:** 202–204, fig. 2 (venation). fig. 14 (male hypopygium).

MALE: Length about 6.5 mm.; wing about 7.5 mm.

FEMALE: Length about 6.5–7.5 mm.; wing 6–7 mm.

General coloration of mesonotum brownish black to black, the narrow lateral borders of praescutum, median region of scutum, parascutella and pleurotergite paler. Antennal flagellum yellow. Legs with femora yellow with a relatively narrow nearly terminal dark brown ring. Wings whitish subhyaline, heavily patterned with dark brown; *Rs* long, angulated at origin. Abdominal tergites pale, each with a conspicuous black triangle, the point directed cephalad, sternites pale.

DISTRIBUTION: Caroline Is. (Kusaie).

KUSAIE: Lelo, Dec. 11, 1937, Esaki (KU); type. Malem, Dec. 20, 1937, Esaki. Mutunlik, 4 females, altitude 22 meters, Feb. 6–15, 1953, Gates Clarke (US). Hill 1010, altitude 300 meters, April 13, 1953, in light trap, Gates Clarke (US).

22. **Limonia (Goniodineura) phaeozoma** Alexander, n. sp. (figs. 58, 59, 64)

Size medium (wing about 6 mm.); mesonotal praescutum extensively yellowed, with a brown central stripe, scutellum dark brown; pleura yellow, with a dark brown girdle on sternopleurite and pteropleurite; knobs of halteres brownish black; femora obscure yellow with a brown subterminal ring; wings pale yellow, conspicuously patterned with brown, including the narrow apex; abdominal segments bicolored, bases narrowly yellow, apices broadly dark brown.

MALE: Length about 5.5–6.5 mm.; wing 5.5–6 mm.

FEMALE: Length about 5.5–7 mm.; wing 5.5–6.3 mm.

Rostrum black, relatively long, about one-half the remainder of head; palpi black. Antennae with scape and pedicel black, flagellum dark brown to brownish black; flagellar segments oval, outwardly becoming long-oval, subequal to their verticils; terminal segment slightly exceeding the penultimate. Head brownish black, sparsely pruinose; anterior vertex narrow, subequal in diameter to a single row of ommatidia.

Cervical region and pronotum black. Mesonotal praescutum extensively yellow, with a brown central stripe that is darker and broader before suture, lateral brown areas marginal; scutal lobe dark brown, central area and posterior callosities light yellow; scutellum dark brown, base and parascutella yellowed; mediotergite dark brown, paler laterally behind, pleurotergite darkened, the katapleurotergite yellowed. Pleura yellow, brown on propleura and anterior anepisternum, very extensive on sternopleurite and the pteropleurite, in cases the darkened color dark brown, in others paler. Halteres with stem yellow, knob brownish black. Legs with all coxae and trochanters yellow; femora obscure yellow with a brown subterminal ring subequal in length to the yellow tip; tibiae and tarsi obscure yellow, terminal tarsal segments slightly darker; claws slender, with a single long spine and two or three more basal obtuse pegs. Wings (figs. 58, 59) pale yellow, the prearcular and costal regions clearer yellow; a conspicuous brown pattern arranged as follows: Arculus, origin of *Rs*, Sc_1, Sc_2, cord, outer end of cell *1st* M_2 and as marginal spots at tips of all longitudinal veins, those at wing apex confluent to form a larger terminal area; stigma subcircular, brown; veins yellow, dark brown in the patterned areas. Longitudinal veins beyond cord with conspicuous dark trichia, before cord present on *C*, *Sc*, outer end of *Rs*, distal half of *M*, and outer ends of Cu_1 and *2nd A*, fewer at tip of *1st A*, lacking on *Sc*. Venation: unusually variable in a series of specimens; Sc_1 ending beyond *r-m*, Sc_2 far retracted, Sc_1 from about two-thirds to subequal in length to *Rs*, the latter and R_{2+3} angulated at origins; cell *1st* M_2 long, *m* commonly longer and more arcuated than

basal section of M_3, in the holotype shorter and straight; *m-cu* subequal to or exceeding the distal section of Cu_1; Anal veins generally parallel to one another.

Abdominal segments bicolored, bases narrowly yellowed, apices broadly dark brown, on sternites slightly paler. Ovipositor with cerci slender, gently upcurved. Male hypopygium (fig. 64) with ninth tergite, *t*, nearly parallel-sided, posterior border with a V-shaped emargination, each lobe with about ten strong chiefly marginal setae, lateral thickened margins narrow, apical borders broader. Basistyle, *b*, with ventromesal lobe oval. Dorsal dististyle, *d*, a curved sickle, narrowed gradually into a long point; ventral style about twice as extensive as the basistyle; rostral prolongation with outer spine stout, about twice the size of the inner, longer than the apex of the prolongation beyond it. Gonapophysis, *g*, with mesal-apical lobe nearly straight, mesal margin with conspicuous denticles. Aedeagus, *a*, terminating in divergent elongate-oval lobes.

Allied to *Limonia* (*Goniodineura*) *phaeonota*, differing most evidently in the brownish black antennal flagellum and the coloration of the thorax, including both the notum and pleura. Materials from the Kayangel Atoll, listed below, are more uniformly pale in body coloration and at first had been believed to represent a further closely related species.

DISTRIBUTION: W. Caroline Is. (Palau).

Holotype, male (US 72336), Palau Is., Malakal I., May 2, 1957, Sabrosky. Allotype, female (US), North end of Peleliu I., May 28, 1957, at light, Sabrosky. Paratopotypes, 2 females, with the allotype. Paratypes, 1 female, Auluptagel, northwestern Palau, 25 meters, Dec. 12, 1952, light trap, Gressitt (BISHOP); numerous males and females, east and north-central Peleliu I., July 28—August 12, 1945, chiefly at light, Dybas (CM); 2 males, 4 females, Kayangel Atoll, Njajangel, Dec. 15–16, 1952, Gressitt (BISHOP); 1 male, May 9, 1957, Sabrosky (US); males and females, southwest Koror, 25 meters, at light, Dec. 19, 1952, Gressitt (BISHOP); Koror, Jan. 1, April 6, May 5, June 11, 1953, Beardsley; Dec. 11–14, 1952, Gressitt (BISHOP); Ngaremlengui, Babelthuap I., June 2–4, 1957, Sabrosky (US).

23. **Limonia** (**Goniodineura**) **pictoides** Alexander, n. sp. (fig. 60)

Allied to *nesopicta;* thorax and abdomen fulvous yellow; femora yellow, tips narrowly black; wings pale yellow with a restricted brown pattern, apex not or only narrowly darkened.

MALE: Length about 6.5 mm.; wing 7 mm.

FEMALE: Length about 6 mm.; wing 6 mm.

Rostrum obscure brownish yellow; palpi black. Antennae with scape and pedicel dark brown, flagellum obscure yellow, segments oval with short concolorous apical pedicels, outer segments more slender, the terminal one about one-half longer than the penultimate. Head brown; anterior vertex greatly reduced to virtually lacking, eyes contiguous in front, narrowly separated behind.

Thorax light yellow to fulvous, without darkened pattern. Halteres with stem and base of knob whitened, remainder of knob dark brown. Legs with coxae light fulvous, trochanters yellow; femora yellow, tips narrowly and abruptly blackened, on hind legs including about the outer tenth, tibiae similarly yellowed, tips more narrowly blackened; basal tarsal segments yellow, apices vaguely darkened, outer three segments uniformly infuscated. Wings

(fig. 60) very pale yellow, prearcular and costal fields clearer yellow; a restricted brown pattern, arranged about as in *nesopicta;* darkened area at arculus narrowly reaching costa at *h*, darkened seams at origin of *Rs*, cord and outer end of cell *1st* M_2 about as in *nesopicta;* stigma small, transversely oval; wing apex not or very narrowly darkened. Longitudinal veins beyond general level of origin of *Rs* with abundant macrotrichia, present also on outer half of *2nd A*, lacking on *Sc*. Venation: Sc_1 ending opposite *r-m*, Sc_2 moderately retracted, Sc_1 subequal to *m-cu;* cell *1st* M_2 elongate, *m-cu* nearly its own length beyond the fork of *M*.

Abdomen uniformly fulvous. Ovipositor with cerci slender, gently upcurved, hypovalvae stouter, straight.

DISTRIBUTION: Eastern Caroline Islands.

Holotype, female (BISHOP 9780), Mokil A., January 27, 1953, Gressitt. A broken male specimen of what appears to represent this species from Ponape, January 17, 1953, Gates Clarke (US).

Subgenus **Idioglochina** Alexander

Dicranomyia (*Idioglochina*) Alexander, 1927, Canad. Ent., **53:** 207 (type: *tusitala* Alexander).—Edwards, 1928, Insects of Samoa (6) **2:** 84–86.

Limonia (*Idioglochina*) Alexander, 1929, Philippine Jour. Sci., **40:** 243.

The most distinctive characters of the subgenus are in the antennae where several species, especially in the male sex, have the individual flagellar segments markedly extended to produce a serrate appearance or, in the more accentuated cases, almost pectinate. In most species the apices of the produced parts bear short stout spinoid setae (figs. 67–69). In the following list of species of the subgenus, those with the flagellar lobes most developed include *allani*, *australiensis*, *flavalis*, *novocaledonica*, *perkinsiana*, *tusitala*, and some others; those with the least produced segments include *marmorata*, *monostromia*, *obesula*, and others.

The male hypopygium of the type species, *tusitala*, has the posterior border of the ninth tergite, *t*, deeply emarginate, the lobes with stout setae; certain other species have the emargination more shallow, the lobes with weaker setae. Two dististyles, in the type species and others, the ventral style lacking rostral spines, in *kronei* with a single weak spine, in *allani* with two conspicuous spines, much as in the subgenus *Dicranomyia*. Aedeagus narrowed outwardly, apex with two very small lobes, genital tubes approximated.

As known, the subgenus includes in excess of 25 species, all being restricted to lands of the Pacific and Indian oceans. From the habits and general occurrence it appears that all species are marine or coastal and require salt water as a habitat for the early stages. Tokunaga, in his important review of the marine crane flies (Kontyû, 1940, 14: 133–148) records 18 species that fall in this category, nine of which are known in their early stages, all living among seaweeds in the intertidal zones, chiefly on islands of the Pacific.

Virtually all species known or suspected to be marine fall in the genus *Limonia.* Attention is directed to still another paper by Tokunaga, an outstanding monographic study of the marine crane fly, therein designated as *Limonia* (*Dicranomyia*) *monostromia* Tokunaga (Mem. Coll. Agr., Kyoto Imperial Univ., no 10: 1–93, 15 tables, 5 diagrams, 17 plates, with 123 figures). This species is marine, occupying the Japanese islands and now is known to belong to the present subgenus. It is very closely related to or perhaps may be identical with *Limonia* (*Idioglochina*) *marmorata* (Osten Sacken), 1861, of coastal North America.

Species of *Idioglochina.*

Pacific Ocean.

allani Alexander—New Zealand (South Island)
ambrosiana Alexander—San Ambrosio I., Chile
bioculata (de Meijere)—Sumatra (Simalur I.)
debeaufortі (de Meijere)—New Guinea
flavalis Alexander—New Guinea
fumipennis (Butler)—New Zealand (North Island)
halobia Tokunaga—Japan (Kyushu)
kotoshoensis (Alexander)—Formosa; Caroline Is.
kronei (Mik)—New Zealand (Subantarctic Is.)
marmorata (Osten Sacken)—Western North America
medidorsalis (Tokunaga)—Japan (Kyushu)
monostromia Tokunaga—Japan
novocaledonica Alexander—New Caledonia
obesula (Edwards)—Guam; New Hebrides
pacifica Tokunaga—Japan
parvimacula Edwards—New Hebrides
perkinsiana Alexander—Northeast Australia (Queensland)
porteri (Alexander)—North Chile
tokara Nobuchi—Japan (Kyushu)
tokunagai Alexander—Japan (Kyushu)
tokunagana Alexander (*gloriosa* Tokunaga, preoccupied)—Japan (Kyushu)
tusitala tusitala (Alexander)—Samoa; Caroline Is.
tusitala palauicola Alexander, n. subsp.—Palau Is.
vilae Edwards—New Hebrides

Indian Ocean.

corallicola corallicola Alexander—Mauritius I.
corallicola mayotteana Alexander—Comoro Is.
lightfooti (Alexander)—Southeast Africa

24. Limonia (Idioglochina) kotoshoensis (Alexander) (figs. 61, 67)

Dicranomyia (*Idioglochina*) *kotoshoensis* Alexander, 1923, Ann. Ent. Soc. America, **16:** 57–58.

Limonia (*Idioglochina*) *kotoshoensis:* Tokunaga, 1940, Kontyû, **14:** 135–136, fig. 3 (wing), figs. 5, 6 (male hypopygium), fig. 14 (male antenna), fig. 15 (female antenna), fig. 17 (claw of male).

Described from Kotosho (Kotosyo) I., Taiwan (Formosa). The original Caroline Island records are by Tokunaga, 1940.

MALE: Length about 5–5.5 mm.; wing 5–5.6 mm.

FEMALE: Length about 6 mm.; wing 7 mm.

General coloration of thorax brownish yellow, praescutum with three broad brown stripes; head gray; wings pale brown, veins brown; abdomen brownish yellow, hypopygium obscure yellow.

Antenna of male (fig. 67) with flagellar segments only moderately produced, as compared with *tusitala* and allied species; outer four or five segments longer than broad, with short but distinct apical pedicels, terminal segment strongly constricted beyond midlength, the narrowed apex about one-half the enlarged base; the constriction described is so well marked that it might be construed as being a suture in which case there would be 15 antennal segments, a condition comparable to that found in *obesula*, *tokunagai*, and some others. Claws of male with three spines, the outermost before midlength, the more basal other spines progressively shorter, the basal one only about one-third the second spine.

Wings (fig. 61) with vein *Sc* very short, Sc_1 ending a distance before origin of *Rs* that is nearly twice the length of the latter, Sc_2 near its tip; R_{1+2} and R_{2+3} generally parallel to one another or very slightly divergent; free tip of Sc_2 faint, shortly before level of R_2; *Rs* about two-thirds the basal section of R_{4+5}; outer branches of R_3 and R_{4+5} nearly parallel with one another, not markedly divergent at margin; cell *1st* M_2 longer than any of the veins beyond it. Macrotrichia on all outer longitudinal veins from R_1 to *2nd A*, present also on outer third of *M*, outer half of basal section of Cu_1 and on apices of both Anal veins; no trichia on *Sc* or *Rs*.

DISTRIBUTION: Taiwan (Formosa), Caroline Is. (Kusaie).

KUSAIE: Lelo, Nov. 21, 1937 Esaki (KU). "Swarming at light on shipboard, at about 300 meters offshore from island of Lelo, associated with *Limonia* (*Dicranomyia*) *pectinunguis* Tokunaga and *L.* (*D.*) *pontophila* Tokunaga" (see Tokunaga, 1940); Lelo, altitude 100 meters, Feb. 18, 1953, Gates Clarke. Funaunpes, altitude 1 meter, Jan. 29, 1953, Gates Clarke. Mutunlik, 20 meters, Jan. 27, Feb. 1, March 1, 1953, Gates Clarke (US, BISHOP). PONAPE I.: Paliker, Rohnkiti (Ronkiti), Jan. 15, 1938. "Swarming on surface of sea water in sunshine along shore of tidal flats in mangrove swamp" (Esaki) (see Tokunaga, 1940).

25. **Limonia (Idioglochina) obesula** (Edwards) (figs. 65, 68)

Dicranomyia (*Idioglochina*) *obesula* Edwards, 1927, Ann. Mag. Nat. Hist. Ser., 9, **20:** 232.

Limonia (*Idioglochina*) *obesula:* Alexander, 1942, Bull. B. P. Bishop Mus., **172:** 198.

The type, a female, was from Tonga Island, New Hebrides, collected July 12, 1925 by P. A. Buxton. A paratype from the Banks Islands, New Hebrides, is in my collection, received from Edwards by exchange.

MARIANA IS. GUAM: Taragui, April 19, 1936, Bryan (BISHOP).

This material agrees so closely with the available paratype that I consider

the determination to be correct.

MALE: Length about 4.5 mm.; wing 5 mm.

FEMALE: Length about 5–5.5 mm.; wing 5.5–6 mm.

General coloration dull blackish brown, slightly pruinose, without distinct markings, the humeri, wing base, postnotum, abdominal sternites and genitalia paler. Legs blackish brown, femoral bases paler.

Antennae (fig. 68) of male with intermediate flagellar segments only slightly produced, each with a very short basal pedicel and a less evident apical one, general appearance of segments oval to transverse-oval, the setae of the protuberance very short, spinoid; terminal segment narrowed, separated from the penultimate segment by a suture to produce a 15-segmented antenna. Claws long and slender, near base with a single developed spine. Wings faintly darkened to darker gray, cell *Sc* and the small stigma darker brown. Macrotrichia of veins very sparse, on most longitudinal veins beyond cord, including only 7 or 8 on outer radial branches and 4 or 5 on outer medial ones; no trichia on *Rs* or basal section of R_{4+5}, sparse trichia at ends of both Anal veins. Venation: *Sc* moderately long, Sc_1 ending about its own length before origin of *Rs*, Sc_2 faint, Sc_1 about one-half *Rs*; free tip of Sc_2 immediately before R_2, the intervening R_1 with two trichia.

Male hypopygium (fig. 65) with ninth tergite, *t*, large and unusually long, posterior border with a small v-shaped emargination, lobes truncate, lateral thickened margins narrow, the posterior thickening heavy, especially near the midline. Basistyle, *b*, elongate, ventromesal lobe not clearly differentiated. Dorsal dististyle, *d*, a gently curved rod lying in notch of the bilobed ventral style, the latter with the inner or rostral part larger than the outer body of style, bearing two strong recurved black spines, on one side of the available male specimen with three such spines. Gonapophysis, *g*, with mesal-apical lobe unusually long and slender, straight, tip narrowly obtuse. Aedeagus slender.

26. **Limonia (Idioglochina) tusitala** (Alexander)

Rhipidia tusitala Alexander, 1921, Bull. Brooklyn Ent. Soc., **16:** 10–11.

Limonia (*Idioglochina*) *tusitala* Alexander, 1921, Canad. Ent., **53:** 207; 1929, Philip. J. Sci., **40:** 241, 245.

Limonia (*Idioglochina*) *tusitala:* Alexander, var., 1940, Annot. Zool. Japon., **19:** 211.

In the 1940 reference cited, I had discussed briefly the interelationships that appear to exist in the so-called *tusitala* complex of species or races. Typical *tusitala* (Samoa) was described from a unique type male, but further materials from the type island were considered briefly by Edwards. In the specimens from the Palau and other Caroline island groups there appears to be a progressive modification in this species that, in the west, culminates in the subspecies here described, chiefly from the Palaus. Specimens from the E. Carolines (Kusaie) appear to be about intermediate between typical *tusitala* and the fly here discussed as *palauicola* n. subsp.

26a. **Limonia (Idioglochina) tusitala palauicola** Alexander, new subspecies (figs. 62, 66, 69)

In coloration, typical *tusitala* is almost uniformly yellow while in *palauicola* there is a conspicuous circular brown spot on each scutal lobe immediately above the wing root and the

lateral praescutal stripes are darker brown than the central vitta. In the male of this fly the veins in the outer radial field and the enclosed stigmal area are much smaller than in typical *tusitala*, vein R_{2+3} being nearly straight and only about one-half longer than *Rs*. In the type male of *tusitala*, vein *R* is greatly thickened, posterior to *Sc* virtually filling the entire cell. This condition does not obtain in the different races.

Antennae of *tusitala palauicola* (fig. 69) with the flagellar branches flattened and produced, each intermediate segment with the apex having about three short stout setae; terminal segment narrowed outwardly but scarcely constricted. Wings (fig. 62) with *Sc* unusually short, Sc_2 usually not evident, when present far retracted; in outer radial field, the free tip of Sc_2 far before R_2, with R_1 curved gently into R_2; outer branches of *Rs* gently divergent. Male hypopygium (fig. 66) with ninth tergite, *t*, large, posterior border with a U-shaped emargination, the broadly obtuse lobes with coarse setae. Ventral dististyle, *d*, small, outer posterior end only slightly produced; rostral spines lacking.

DISTRIBUTION: Caroline Islands.

Holotype, male (US 72337), Ngaiangl A., Palau Is., along beach in *Pandanus* zone, May 9, 1957, Sabrosky. Allotopotype, female (US). Paratopotypes, 7 males and females. Paratypes, numerous, both sexes, at the type locality, as Kayangel (Ngajangel) A., Ngariungs I., light trap, December 15–16, 1952, Beardsley and Gressitt (BISHOP, US). Further paratypes, Palau Is., southwest Koror I., 25 meters, Dec. 19, 1952, Gressitt. Peleliu I., Palau Is., E. and N. central parts, on boat off shore, July 31—Aug. 1, 1945, Dybas FM (CM).

Additional specimens, intermediate between *tusitala* and *palauicola:* Caroline Is., Ponape I., Colonia, Jokaji (Jokaj), Nov. 18, 1937, Esaki; Malem, Dec. 18, 1937; Rohnkiti-Paliker (Palikir), Jan. 15, 1938, Esaki (KU). Kusaie I. Inshappu, Jan. 24, 1936, Zenyemon Ono (BISHOP). Lelo (Lele), Nov. 21, 1937, at light on shipboard, Esaki (KU). Mutunlik, 22 meters, Feb. 6–15, 1953, Clarke (BISHOP).

The Caroline Island materials collected by Esaki and associates earlier had been recorded as being *tusitala* (Alexander), var. (Alexander, 1940: 211).

Subgenus **Libnotes** Westwood

Libnotes Westwood, 1876, Trans. Ent. Soc. London for 1876: 505, plate 3, fig. 6 b (venation); Ibid., 1881: 383. (type: *thwaitesiana* Westwood).—Osten Sacken, 1887, Berlin. Ent. Zeitsch., **31:** 179–183.—Edwards, 1928, J. Fed. Malay States Mus., **14:** 74–85. (name credited to Osten Sacken, in error).

Limonia (*Libnotes*)*:* Alexander, 1929, Philip. J. Sci., **40:** 241, 242.

A large and involved subdivision of *Limonia*, among the older proposed subgeneric groups being most similar to typical *Limonia*. Most of the species

are Oriental, with some 70 species being included in the recent Alexander and Alexander Catalogue of the Oriental Tipulidae. To the west in Africa only one or two species are entirely typical, such as *libnotina* Alexander, of South Africa, but there remain a considerable number of species in continental Africa and Madagascar that differ from *Libnotes* in venation while being very similar in hypopygial structure. These have been separated as a distinct group, *Afrolimonia* Alexander (Trans. American Ent. Soc., 91: 48–49, 1965) that may prove to be difficult to maintain as being distinct from the present subgenus. In the Australasian region a considerable number of species are found, especially in New Guinea, where about a score presently are known, with fewer in eastern Australia. A relatively small number of species occur in the major Pacific islands, excluding Micronesia, as follows.

colossus Alexander—(Fiji, Solomons)
elachista Alex.—(Solomons, New Guinea)
greenwoodi (Alex.)—(Fiji)
hollandi Alex.—(New Ireland)
howensis (Alex.)—(Lord Howe Island)
perkinsi (Grimshaw)—(Widespread: Hawaii, Fiji, Samoa, Tahiti, Marquesas, and elsewhere)
quinquegeminata Alex.—(New Hebrides)
suttoni Alex.—(New Britain)
willowsi Alex.—(Solomons)

Antennae 14-segmented, terminal segment long and slender, outwardly narrowed, in some species nearly as long as the preceding two segments combined, in others shorter; longest verticils commonly not exceeding the segments. Legs with vestiture of fore femora and tibiae in male commonly with abundant small spinoid setae, those on tarsi normal, middle and posterior legs of male and all legs in female with normal setae only; claws of male elongate, on lower face with a series of spines, the outermost long and slender, the others, six or seven in number, small and crowded.

Wings (figs. 19, 70–74) with vein *Sc* long, ending some distance beyond fork of *Rs* or the other elements comprising the cord; *Rs* short, oblique, originating at or close to midlength of wing; cell *1st* M_2 long and narrow, with base of cell *2nd* M_2 usually some distance basad of that of cell M_3 and with *m-cu* more than its own length beyond the fork of *M*. Longitudinal veins beyond cord very long, generally parallel to one another, at outer ends deflected strongly caudad so all end at or beyond the wing tip. Vein *2nd A*, especially in the male, beyond the prearcular crossvein lying close to wing margin, thence directed strongly cephalad so as to approach vein *1st A*, the vein appearing sinuous. Veins at outer end of vein R_1 providing characters of importance in classification, especially the relative positions of the free tip of vein Sc_2 and vein R_2, and the length of vein R_{1+2} between these veins, the latter character differing in the sexes and appearing to be variable. Costa unusually thickened outwardly, with very abundant setae that are arranged in several rows, these setae shorter and more spinoid in the males. Longitudinal veins beyond the general level of cord with abundant normal trichia. As has been emphasized by Osten Sacken, Edwards, and the writer, in its venation *Libnotes* essentially is a *Limonia* with the elements beyond the cord highly modified.

Male hypopygium (figs. 75–77) with the ninth tergite, *t*, large, posterior border truncated

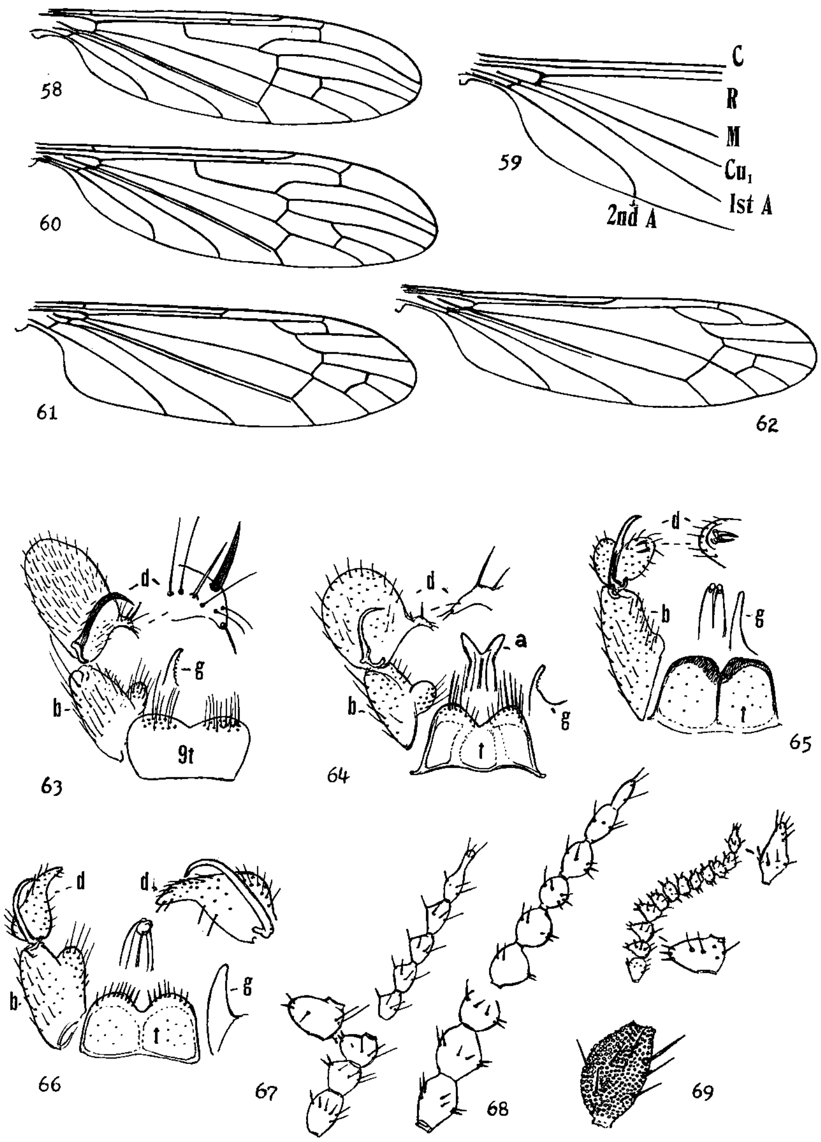

FIGURE 58–69. Genus *Limonia* Meigen; Subgenera *Goniodineura* van der Wulp and *Idioglochina* Alexander. **58, 59.** *Limonia* (*Goniodineura*) *phaeozoma* Alexander, n. sp.; venation **60.** *Limonia* (*Goniodineura*) *pictoides* Alexander, n. sp.; venation **61.** *Limonia* (*Idioglochina*) *kotoshoensis* Alexander; venation **62.** *Limonia* (*Idioglochina*) *tusitala palauicola* Alexander, n. subsp.; venation **63.** *Limonia* (*Goniodineura*) *nesopicta* Alexander; male hypopygium **64.** *Limonia* (*Goniodineura*) *phaeozoma* Alexander, n. sp.; male hypopygium **65.** *Limonia* (*Idioglochina*) *obesula* Edwards; male hypopygium **66.** *Limonia* (*Idioglochina*) *tusitala palauicola* Alexander, n. subsp.; male hypopygium **67.** *Limonia* (*Idioglochina*) *kotoshoeniss* Alexander; male antenna **68.** *Limonia* (*Idioglochina*) *obesula* Edwards; male antenna **69.** *Limonia* (*Idioglochina*) *tusitala palauicola* Alexander, n. subsp.; male antenna (Symbols: *a*, aedeagus; *b*, basistyle; *d*, dististyles; *g*, gonapophysis; *t*, ninth tergite).

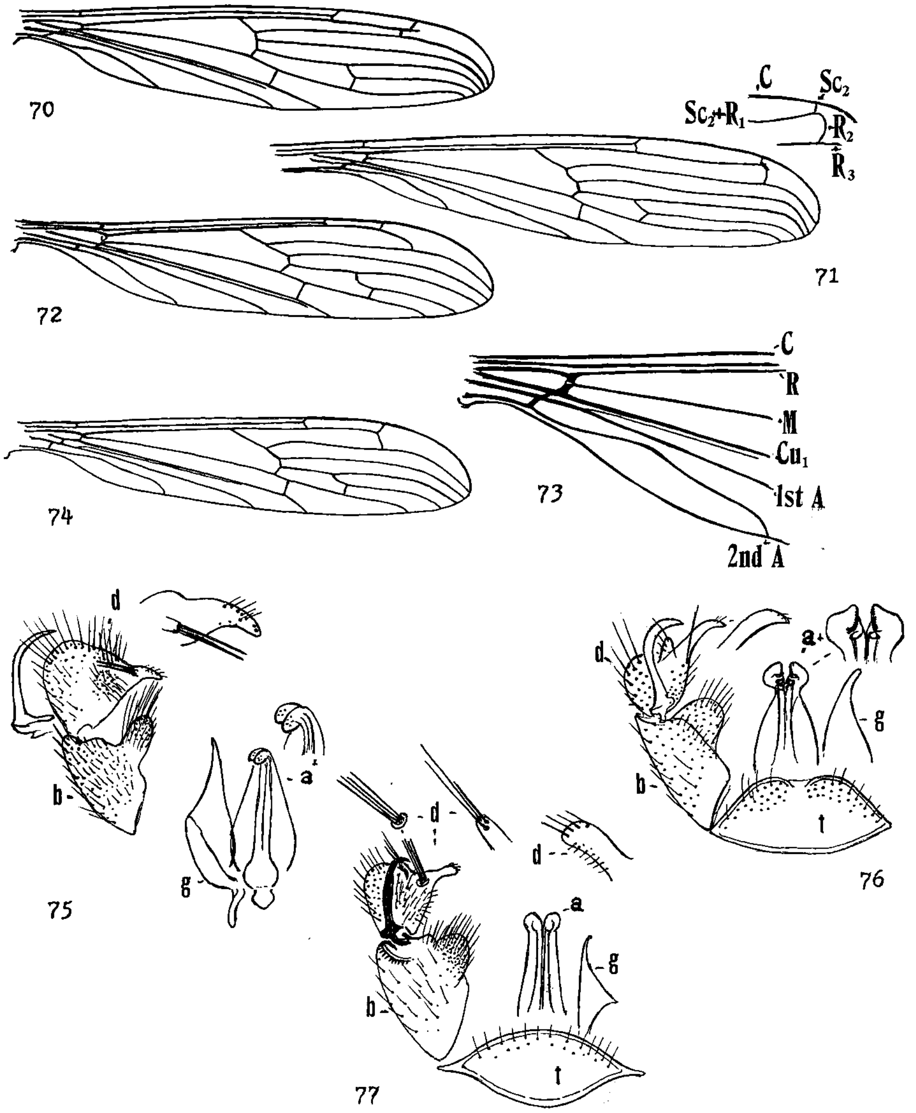

FIGURE 70–77. Genus *Limonia* Meigen; Subgenus *Libnotes* Westwood. **70.** *Limonia* (*Libnotes*) *kusaiensis* Alexander; venation **71.** *Limonia* (*Libnotes*) *majorina* Alexander, n. sp.; venation **72.** *Limonia* (*Libnotes*) *sabroskyi* Alexander, n. sp.; venation **73.** *Limonia* (*Libnotes*) *strigivena* (Walker); venation **74.** *Limonia* (*Libnotes*) *trukensis* Alexander, n. sp.; venation **75.** *Limonia* (*Libnotes*) *majorina* Alexander, n. sp.; male hypopygium **76.** *Limonia* (*Libnotes*) *sabroskyi* Alexander, n. sp.; male hypopygium **77.** *Limonia* (*Libnotes*) *trukensis* Alexander, n. sp.; male hypopygium (Symbols: *a*, aedeagus; *b*, basistyle; *d*, dististyles; *t*, ninth tergite).

to more strongly produced to appear convex, the sparse setae arranged in a transverse row behind the margin. Basistyle, *b*, larger than the ventral dististyle, with sparse vestiture, setae of ventromesal lobe few in number but very long; on face of style near base of prolongation with a tubercle that bears four or more very long setae that form a narrow tuft. Dorsal dististyle, *d*, a long slender smooth rod, outer end curved and gently narrowed to the acute tip; ventral style with body small, rostral prolongation conspicuous, compressed, rostral spines close to base, commonly two in number, of moderate length, in cases very long, being nearly equal to the prolongation itself, commonly directed basad; other species have more numerous rostral spines, from three (*quadrifurca* Walker, *restricta* Alexander) to 8 to 12 (as in *quinquegeminata* Alexander, *willowsi* Alexander). Gonapophysis, *g*, broad basally, mesal-apical lobe elongate, extended caudad into a spine. Aedeagus, *a*, with apex decurved, slightly to more strongly bilobed.

In the basic discussion of *Libnotes* by Edwards, 1928, as cited, the limits of the subgenus were broadly construed, including species that now are placed in several other groups, including *Goniodineura* van der Wulp, and three subgenera described as new later in the present report, *Metalibnotes*, *Neolibnotes*, and *Paralibnotes*.

Biology. The early stages of *Limonia* (*Libnotes*) *perkinsi*, as found in Hawaii, have been discussed in detail by Williams (1943: 314–317) and show an extraordinary range of habitats that may well be found to be the case in other species. Commonly, these occurred in tree holes that were partly filled with mud and water, in the leaf bases of pandanus (*Pandanus odoratissimus* Linn.), and other plants, behind the leaf sheaths of banana, in the damp humus of potted ferns, in decaying sugarcane, and in old decaying tree trunks. In rarer cases the early stages are found in small mud-floored water pockets in the beds of streams. This paper by Williams provides detailed accounts of several other Hawaiian species of *Limonia*, all others being in the subgenus *Dicranomyia*.

27. **Limonia** (**Libnotes**) **kusaiensis** Alexander (fig. 70)

Limonia (*Libnotes*) *kusaiensis* Alexander, 1940, Annot. Zool. Japon., **19:** 200–202.

MALE: Length about 10–14 mm.; wing 15–19 mm.

FEMALE: Length about 8 mm.; wing 12 mm.

Male. Size larger than in female. Palpi yellow; antennae with terminal segment elongate; eyes broadly contiguous. Mesonotal praescutum with discal area reddish brown, lateral portions of the area bordered by darker, lateral praescutal margins yellow, pleura uniformly yellow. Legs yellow, femoral tips broadly and conspicuously black, tips of tibiae scarcely darkened. Wings pale yellow, prearcular and costal fields more saturated yellow; a conspicuous brown pattern includes a complete postarcular fascia and an irregular band at cord. Venation (fig. 70) with cell *1st* M_2 elongate, subequal to vein M_3 beyond it. Abdominal tergites yellow, segments two to six inclusive with a blackened ring at near midlength.

Female (allotype). Characters generally as in male, differing as follows: praescutum pale yellow, patterned with pale brown to form a transverse band extending from side to side, narrowly interrupted at midline, the intermediate stripes narrowly separated, the darkened saddle

leaving major yellow humeral areas and a larger posterior part; scutal darkenings confluent, conspicuous. Wings almost as in type male, differing only in relatively slight venational features, including the somewhat less decurved outer radial veins. Abdomen bicolored, as in male, but with the basal brightening more obscured to scarcely evident, the posterior darkened borders broad and conspicuous. Ovipositor with cerci slender, tips acute; hypovalvae stout, straight.

DISTRIBUTION: Caroline Is. (Kusaie, Ponape).

Kusaie I., Fwinkol, Dec. 9, 1937, Esaki, (KU) ♂ type. ♀ Kusaie I., without more exact data, July 23, 1949, R. P. Owen, M-4333, Ponape I., Kolonia, Jan. 17, 1938, Esaki.

28. Limonia (Libnotes) majorina Alexander, n. sp. (figs. 71, 75)

Allied to *colossus;* legs obscure yellow; wings yellowed, restrictedly patterned with pale brown along certain of the veins; free tip of Sc_2 almost in transverse alignment with R_2; cell *1st* M_2 relatively small, *m* about one-half longer than basal section of M_3; veins beyond cell *1st* M_2 very long, M_4 being nearly twice M_{3+4}; *m-cu* less than its own length beyond fork of *M;* male hypopygium with rostral spines of ventral dististyle two, in length subequal to the prolongation, setiferous lobe of ventral style relatively low, with few long strong setae; apex of aedeagus terminating in two relatively large decurved lobes.

MALE: Length about 18 mm.; wing 23 mm.; antenna about 2.5 mm.

Rostrum light brown, palpi yellow. Antennae with scape and pedicel light brown, flagellum yellow; proximal flagellar segments oval, outwardly passing into cylindrical, terminal segment about one-half longer than the penultimate; longest verticil only slightly longer than the segment, paler than the shorter normal black setae. Anterior vertex reduced to a capillary yellow stripe; remainder of head light brownish, narrowly gray along eye.

Cervical regions and pronotum yellow. Mesonotal praescutum with ground yellowed, with four scarcely indicated pale brown stripes, scutal lobes patterned with similar brown areas; scutellum and postnotum more whitened pruinose. Propleura light yellow, remainder of pleura yellowish white without evident pattern. Halteres yellow, base of knob tinged with orange. Legs with coxae and trochanters orange yellow, basal edge of latter narrowly black; remainder of legs obscure yellow, without pattern, this possibly resulting from the apparent somewhat teneral condition; fore legs with abundant small spinoid setae, on proximal tarsal segments somewhat longer and stouter, on outer segments becoming normal setae. Wings (fig. 71) yellowed, with a restricted pale brown spotted pattern on certain veins, the marks evidently darker in fully colored specimens, the most evident areas on veins along cord, including base and apex of *Rs*, and as a series of spots along *Cu;* a less evident pattern at forks of *Sc* and *R*, outer end of cell *1st* M_2 and as scattered spots along longitudinal veins, both before and beyond the cord; veins yellow, darker in the patterned parts. Costa (male) with abundant small spinoid setae, similar but fewer on *R*, those of the more posterior veins normal, long and delicate. Venation: *Sc* long, Sc_2 nearly opposite crossvein *m;* free tip of Sc_2 short, in almost transverse alignment with R_2 (as shown in diagram); cell *1st* M_2 relatively small, narrow, *m* about one-half longer than basal section of M_3; veins beyond cell *1st* M_2 very long, M_4 nearly twice M_{3+4}; *m-cu* less than its own length beyond fork of *M;* all veins beyond cord strongly decurved at outer ends, terminating at or beyond the wing apex.

Abdomen chiefly dark chestnut brown, vaguely patterned, pleural membrane more infuscated. Male hypopygium (fig. 75) with setae of ventromesal lobe of basistyle, *b*, very long. Dorsal dististyle, *d*, strongly curved at near two-thirds the length, terminating in a more narrowed twisted blade; ventral style small, rostral prolongation compressed, spines two, long, subequal to or slightly longer than the prolongation, placed at summit of a stout basal tubercle;

body of style with abundant long setae; setiferous lobe on face of style apparently broad, with relatively few but very long setae. Gonapophysis, *g*, an elongate triangular plate, the apical point narrowed into a spine. Aedeagus, *a*, broad, apex terminating in two relatively large decurved lobes.

DISTRIBUTION: W. Caroline Is. (Palau)

Holotype, male, FM (CM), Palau Is., Peleliu I., Aug. 12, 1945, Dybas.

The present fly is allied to *Limonia* (*Libnotes*) *notata* (van der Wulp) and is closest to *L.* (*L.*) *colossus* Alexander, from Fiji and the Solomon Islands. These two flies are nearly equal in their large size and with the venation and hypopygial structure generally the same. The latter species has the legs darkened and has abundant brown seams on all longitudinal veins posterior to vein *R*. The unique type of *majorina* is somewhat teneral but the general pattern of the body and appendages appears to be about as described. The relative lengths of veins M_{3+4} and M_4 should be emphasized. *L.* (*L.*) *strigivena* (Walker), described from Dorey, New Guinea, is a smaller fly, the wing veins with numerous brown spots, and with vein M_{3+4} only about two-thirds as long as M_4.

29. **Limonia** (**Libnotes**) **notata notata** (van der Wulp)

Libnotes notata vander Wulp, 1878, Tijdschr. Ent., **21:** 194–195, plate 12, 12, fig. 5 (venation).—Osten Sacken, 1887, Berlin. Ent. Zeitschr., **31:** 183.—Edwards, 1928, J. Fed. Malay States Mus., **14:** 75.

Van der Wulp's type was from Sumatra, collected by Giesbers. What is considered to be this subspecies is widely distributed in the Oriental region but there are various other named forms in the Pacific area whose exact relationships remain unsettled.

In the typical form the antennal flagellum commonly is yellow or brownish yellow, but in cases is infuscated. Anterior thoracic pleura with a narrow broken dark brown longitudinal stripe, including isolated spots on the propleura and ventral anepisternum, with a paler line at midheight of the sternopleurite. Darkened pattern of praescutum pale brown, intermediate stripes indicated on posterior half only; postnotum gray pruinose, narrowly blackened on the interpostnotal suture. Halteres with knobs dark brown. Legs with coxae testaceous, fore pair with a transverse black band; femora yellow to brownish yellow, tips not or scarcely darkened; femoral vestiture in male not markedly spinoid. Wings with *m* arcuated, about three times the basal section of M_3; cell *1st* M_2 unusually long and narrow, inner end of cell *2nd* M_2 at or beyond two-thirds the length of cell *1st* M_2; *m-cu* in cases to twice its length beyond fork of *M*.

Certain of the specimens from the Palau Islands are very small (length about 8–9 mm; wing 10.5–11 mm.). A female from Koror, as recorded below, is the smallest specimen so far made known (length about 6 m.; wing 7.5 mm.). In all regards this dwarf individual agrees with the normal specimens and must be assigned here.

DISTRIBUTION: Caroline Is. (Palau, Ifaluk, Yap).

PALAU. PELELIU: north-central, July 31—Aug. 5, 1945, Dybas. GARAKAYO: Aug. 8, 1945, Dybas FM (CM). KOROR: Dec. 14, 1952, Gressitt (BI-

SHOP); specimen indicated above, March 1954, by sweeping, (Beardsley) (BISHOP).

IFALUK A. IFALUK Aug. 12, 1953, Bates (US). YAP. YAP: Kolonia, June 21, 1957, Sabrosky (US); Mt. Matade, alt. 95 meters, Dec. 1–3, 1952, Gressitt.

29A. Limonia (Libnotes) notata solomonis (Alexander)

Libnotes solomonis Alexander, 1924, Ann. Mag. Nat. Hist. Ser., 9 **13:** 39–40.

Limonia (Libnotes) solomonis: Alexander, 1940, Annot. Zool. Japon., **19:** 200.

The type of *solomonis* was from Guadalcanal I., Solomon Islands, collected in January 1921 by J. A. Kusche. Widely distributed in Micronesia.

The essential characters that separate this fly from typical *notata* have been given in the key to the genus, provided earlier.

General coloration yellow, restrictedly patterned with brown, pleura narrowly lined with dark brown. Antennal flagellum brownish yellow. Legs yellow, tips of femora broadly brownish black, tibiae, especially the fore pair, with bases narrowly darkened. Wings whitened, the dark pattern restricted to areas at origin of *Rs*, tip of *Sc* and the stigma, with further marginal seams at ends of cubital and anal veins. Venation: M_{3+4} longer than M_4.

DISTRIBUTION: Caroline Is (Palau, Kusaie, Ponape, Truk).

PALAU. KOROR: Dec. 29, 1952, at light, May 2, 1953, Beardsley (US).

KUSAIE: Hill 1010, altitude 300 meters, Apr. 13, 1953, Clarke. Songkosra, altitude 120 meters, Apr. 23, 1953, Clarke (US). PONAPE: Nampir—Kolonia, Jan. 5–17, 1938, Esaki (KU). (Alexander, 1940: 200). TRUK. TOL: Mt. Uniböt, alt. 25–50 meters, Dec. 31, 1952; 390 meters, Feb. 5, 1953, Gressitt (BISHOP).

The Songkosra specimen is most typical of the present race, having the vestiture of the legs and costal fringe of wing very short and spinulose.

30. Limonia (Libnotes) sabroskyi Alexander, n. sp. (figs. 72, 76)

Size medium (wing of male to 12 mm.); mesonotal praescutum obscure yellow with four brown stripes, the anterior end darkened; pleura yellow, with two brownish black longitudinal stripes, the ventral one narrower; antennae black; halteres brownish black; legs with femora brownish yellow with a broad black subterminal ring, preceded and followed by narrower clear yellow annuli; wings light yellow, extensively suffused with pale brown, with darker brown spots that are restricted to the veins; free tip of Sc_2 some distance basad of R_2, *Rs* and basal section of R_{4+5} straight, in oblique alignment; cell *1st* M_2 elongate, inner end of cell *2nd* M_2 at from about three-fourths to four-fifths its length, *m-cu* about opposite one-third to one-fourth M_{3+4}; abdomen brown, bases of tergites patterned with yellow, outer sternites yellow, darkened laterally, hypopygium yellow; male hypopygium with ventral dististyle small, rostral prolongation a flattened cleaverlike blade; apex of aedeagus with two flattened sclerotized plates.

MALE: Length about 7–9 mm.; wing 8–12 mm.; antenna about 2.2–2.4 mm.

FEMALE: Length about 8 mm.; wing 8.5–9 mm.

Rostrum relatively small, testaceous yellow, apex blackened; basal segment of palpus infuscated, the remainder brownish yellow. Antennae black; basal flagellar segments oval, outer ones more elongated, terminal segment about one-third longer than the penultimate; verticils shorter than the segments. Head fulvous, posterior vertex vaguely lined longitudinally with fulvous brown, occipital triangle more grayish; anterior vertex narrow, about one-half the diameter of scape or less.

Pronotum fulvous orange, vaguely patterned with pale brown. Mesonotal praescutum with the very restricted ground yellow, with four brown stripes, the intermediate pair in cases confluent in front, expanded and more darkened at anterior end; scutal lobes dark brown, median area obscure yellow; scutellum dark brown, posterior border obscure yellow, parascutella brownish yellow; mediotergite dark brown, pleurotergite yellow, darkened dorsally. Pleura yellow, with two longitudinal brownish black stripes, the dorsal one broad, including the dorsopleural region, extending from sides of the cervical region and propleura, crossing the anepisternum and dorsal pteropleurite onto the anapleurotergite; ventral stripe narrow, broken, including the dorsal sternopleurite, meron, and parts of the fore and middle coxae. Halteres brownish black, base of stem narrowly yellowed. Legs with coxae yellow, lined with brownish black, as described; trochanters yellow; femora brownish yellow with a broad black subterminal ring, apex and a subterminal annulus clear yellow, the latter about one-half as wide as the blackened ring; tibiae yellow, extreme base whitened, followed by a narrow darkening, tip narrowly black; tarsi yellow, tips narrowly brownish black; claw with a long outer spine before midlength, with a concentration of smaller spines nearer base. Wings (fig. 72) with the restricted ground light yellow, cells posterior to costal border extensively clouded with pale brown, with scattered darker brown spots that are restricted to the veins, distributed as follows; origin and fork of *Rs*, cord, outer end of cell *1st* M_2, tip of Sc_2, free tip of Sc_2, R_2, and marginal areas at ends of veins R_3, M_{1+2}, M_3, M_4, Cu_1, and the Anals, lacking on vein R_{4+5} which is clear yellow; veins yellow, darker in the faintly clouded areas, still darker brown in the spotted parts, free tip of Sc_2 pale. Veins beyond cord chiefly with macrotrichia, these lacking on bases of R_{2+3} and R_{4+5}, and on all veins comprising cell *1st* M_2; no trichia on veins basad of cord excepting the dense costal fringe, a restricted series on *R*, becoming very small to microscopic outwardly, and a few trichia near outer end of basal section of Cu_1. Venation: Sc_1 long; free tip of Sc_2 some distance before R_2; *Rs* and basal section of R_{4+5} subequal, straight, in oblique alignment; radial branches only moderately decurved; cell *1st* M_2 elongate, with inner end of *2nd* M_2 at near three-fourths to four-fifths the length, *m-cu* about opposite one-third to one-fourth M_{3+4}; shorter than either the basal section of M_{3+4} or distal section of Cu_1; Anal veins convergent basally.

Basal abdominal tergites brown, proximal segments vaguely brightened near bases, intermediate tergites narrowly yellowed basally, apices dark brown; outer sternites light yellow, sides restrictedly darkened; hypopygium yellow. Ovipositor with valves small, dark brown, tips of cerci simple. Male hypopygium (fig. 76) with ninth tergite, *t*, transverse, widest before midlength, thence narrowed to the obtuse apex which terminates in two very low lobes, tergal setae relatively short but numerous, continued backward along sides to the cephalic lateral angles. Basistyle, *b*, relatively long, ventromesal lobe large, tip obtusely rounded. Dorsal dististyle, *d*, a strong smooth rod, curved beyond midlength, narrowed gradually to the acute tip; ventral style small, its area less than one-half that of basistyle; rostral prolongation a flattened cleaverlike blade, at its base with a fleshy lobe. Gonapophysis, *g*, elongate-triangular, narrowed outwardly to the obtuse tip. Aedeagus, *a*, broad, apex with two flattened sclerotized plates.

DISTRIBUTION: Caroline (Palau) Is.

Holotype, male, (US 72338), Palau Is., Babelthuap I., Ngerehelong Peninsula, May 7, 1957, Sabrosky. Allotype, female, (US) Babelthuap, Ngiwal, in jungle, May 21, 1957, Sabrosky. Paratypes, one female, with allotype; one very small male, Garakayo (Ngergoi) I., Aug. 8, 1945, Dybas (CM, BISHOP).

This interesting crane fly is dedicated to the collector, the distinguished student of the Diptera, Dr. Curtis W. Sabrosky.

In the wing coloration the fly is somewhat like *Limonia* (*Libnotes*) *muscicola* Alexander, 1942 (*sphagnicola* Edwards, 1926, preoccupied), of Buru, differing from this and other members of the subgenus in the coloration of the body and wings and in the venation, particularly in the position of the free tip of Sc_2 in relation to vein R_2. Only a few members of this extensive subgenus show this venational feature, the others having Sc_2 opposite R_2 or extended beyond this point.

31. Limonia (Libnotes) strigivena (Walker) (fig. 73)

Limnobia strigivena Walker, 1861, J. Linn. Soc. London, **5:** 229.—Edwards, 1928, J. Fed. Malay States Mus., **14:** 75.

Limonia (*Libnotes*) *strigivena:* Alexander, 1942, Bull. B. P. Bishop Mus., **172:** 195.

Walker's types were from Dorey, New Guinea, collected by Alfred Russel Wallace.

FEMALE: Length about 8–14 mm.; wing 9.5–16 mm.

Head brown; anterior vertex and orbits gray; anterior vertex very narrow, about equal in width to two rows of ommatidia. Antennae with scape and pedicel dark brown, flagellum brownish yellow; flagellar segments oval, the outer ones longer, all exceeding their verticils. Mesonotal praescutum obscure yellow, with four brown stripes, in cases these faint and obscured; scutellum and postnotum yellow. Halteres light yellow. Legs with femora yellow, tips of fore pair broadly brownish black, on remaining legs these areas narrower and subterminal in position. Wings (fig. 73) with the spots on veins variable in number, in cases reduced to two or three spots on the individual sections of the veins. Venation: *m* unusually short, less than three times the straight basal section of vein M_3. Ovipositor with both cerci and hypovalvae bearing a microscopic tooth before apex.

I am interpreting the species following Edwards who examined Walker's type. The halteres are uniformly light yellow in materials available, not whitish with blackish knobs, as noted by Walker.

Widespread in the Oriental-Australasian regions.

DISTRIBUTION: Mariana Is. (Guam), Caroline Is. (Palau, Truk).

MARIANA IS. GUAM: Fadian, "ex rotten bark of dug-dug," Sept. 22, 1936, Swezey. Edwards (Samoa Report, p. 81) likewise records the species as having the early stages beneath dead bark.

PALAU. KOROR: NE, on limestone ridge, altitude 100 feet, April 28,

1957, Sabrosky (US). NGAIANGL A.: in *Pandanus* association along beach, May 9, 1957 (Sabrosky), US. Peleliu I., north-central and east, Aug. 1–12, 1945, Dybas (CM).

TRUK. TON (Tol): Mt. Uniböt, altitude 390 meters, Feb. 4, 1953, Gressitt (BISHOP).

32. Limonia (Libnotes) trukensis Alexander, n. sp. (figs. 74, 77)

General coloration of praescutum orange yellow, posterior half with four pale brown stripes, pleura light yellow with a narrow brown longitudinal stripe; femora brownish yellow with a narrow brown subterminal ring; wings weakly darkened, both the veins and the posterior cells with numerous pale brown clouds; free tip of Sc_2 and R_2 in transverse alignment; M_{3+4} and M_4 subequal, *m* about twice the basal section of M_3; ventral dististyle of hypopygium with four long rostral spines.

MALE: Length about 10 mm.; wing 11 mm.; antenna about 2 mm.

Rostrum and palpi yellow. Antennae with scape and pedicel brownish yellow, flagellum dark brown; flagellar segments suboval, longest verticils subequal to the segments; terminal segment narrowed outwardly, about one-third longer than the penultimate. Head above light cinnamon, orbits narrowly more yellowed, genae brownish gray; anterior vertex narrow, about equal in width to two rows of ommatidia.

Pronotal scutum light brown, more orange behind, scutellum light yellow. Mesonotal praescutum with anterior half chiefly orange-yellow, cephalic border narrowly darkened, posterior half with four pale brown stripes; scutum brownish yellow, each lobe patterned with light brown; scutellum light brown, posterior border yellow, parascutella yellow; postnotum light brown, yellow pollinose. Pleura light yellow, patterned with dark brown, including a narrow ventral stripe, slightly including the fore coxae and centers of sternopleurite and meron; a further smaller paler brown stripe, chiefly on the anepisternum, less evident on propleura. Halteres with stem yellow, knob pale brown. Legs with coxae yellow, extreme posterior border of fore pair vaguely darkened, as described; trochanters yellow; femora brownish yellow, with a narrow brown subterminal ring, subequal in extent to the yellow tip; tibiae yellow, apices very narrowly brown; tarsi yellow, outer three segments darker; claws long and only slightly curved, with a conspicuous spine at near midlength and a more basal comb of five smaller teeth, the outermost longer. Wings (fig. 74) with the ground weakly darkened, cell *Sc* clear yellow; a restricted brown spotted and dotted pattern that involves both the veins and the membrane; darkenings at origin of *Rs*, tip of *Sc* and outer end of *R* restricted in size and relatively inconspicuous; darkened spots on all longitudinal veins, more or less confluent, those on vein *Cu* in cell *M* larger and darker; sparse and very vague paler brown clouds in the cells, most conspicuous along posterior border in the cubital and anal cells; veins yellow, darker in the patterned parts. Venation as in the subgenus; free tip of Sc_2 and R_2 in transverse alignment; outer radial veins only moderately decurved; M_{3+4} and M_4 subequal; *m* about twice the length of basal section of M_3; *m-cu* at near one-fifth the length of M_{3+4}.

Abdominal tergites brownish yellow, extreme lateral borders brownish black to form a continuous line, sternites clearer yellow. Male hypopygium (fig. 77) with the ninth tergite, *t*, transversely oval in outline, lateral ends extended into points, posterior border gently convex, cephalic margin more strongly so; setae of small to medium size, restricted to posterior third. Basistyle, *b*, about one-half more extensive than the ventral dististyle, ventromesal lobe oval, provided with abundant long yellow setae; apex of outer margin of style with a low flange that bears a row of small spinoid setae. Dorsal dististyle, *d*, slightly dilated at near midlength, curved and narrowed to an acute point; ventral style oval, accessory lobe at base of prolonga-

tion with three setae, two of which are long, one nearly terminal, the other more basal in position; rostral prolongation flattened, tip obtuse, with four strong yellow setae; rostral spines basal in position, elongate, four in number, in a compact group. Gonapophysis, *g*, with mesal-apical lobe long and slender, extreme tip slightly bent. Aedeagus, *a*, broad, terminating in two circular lobes; genital tubes closely applied to one another, together slightly broader than the lateral flanges.

DISTRIBUTION: Caroline Is. (Truk).

Holotype, male, (US 72339) Truk Is., Tol I. Mt. Uniböt, altitude 25–50 meters, in lower native forest, Dec. 31, 1952, Gressitt.

The most similar species is *Limonia* (*Libnotes*) *strigivena* (Walker), as indicated in the key to species earlier in this report.

Subgenus **Limonia** Meigen

The synonymy and general account of the subgenus have been given earlier in this report under the generic heading. *Limonia* is separated from other subgenera chiefly by characters of venation and hypopygial structure, especially the single unmodified dististyle of the latter (figs. 83, 84). There are representatives in all major faunal areas with the greatest concentration of species in the Holarctic and Oriental regions.

33. **Limonia** (**Limonia**) **elephantella** Alexander, n. sp. (figs. 78, 81, 83)

Size medium (wing about 5 mm.); mesonotal praescutum and scutal lobes polished brownish black, thoracic pleura brownish yellow, striped longitudinally with black; antennae of male relatively long, flagellar segments conspicuously pedicellate; halteres and legs darkened, wings strongly infuscated, Sc_1 ending about opposite midlength of *Rs*, cell *1st* M_2 closed; male hypopygium with ninth tergite large, posterior lobes relatively narrow; gonapophysis bilobed, obtuse; aedeagus terminating in two large obtuse lobes.

MALE: Length about 5 mm.; wing 5 mm.; antenna about 1.4 mm.

Rostrum and palpi black. Antennae (fig. 81) relatively long, black; flagellar segments strongly constricted to form darkened apical pedicels, stout on proximal segments, abrupt and narrower on outer ones; segments with dense dark pubescence, the verticils less than one-half the length of segments. Front and anterior vertex light gray, posterior vertex dull black, sparsely pruinose; anterior vertex narrow, subequal to a single row of ommatidia.

Pronotum and mesonotum polished brownish black, scutal lobes more intensely blackened, lateral praescutal borders broadly brownish yellow. Pleura brownish yellow with a broad black longitudinal stripe extending from cervical region and propleura to base of abdomen, most evident on the anepisternum and dorsal pteropleurite. Halteres blackened, base of stem narrowly yellowed. Legs with coxae and trochanters testaceous yellow; femora dark brown, bases more yellowed, outwardly deepening to black, remaining segments brownish black; claws small, nearly straight, with about six teeth clustered at base, extended outwardly into hairlike tips, three proximal denticles much smaller. Wings (fig. 78) strongly infuscated, stigma small, oval, darker brown; veins dark brown. Longitudinal veins beyond general level of *Rs* with macrotrichia, with others on *C*, *Sc*, *R*, outer half of *M*, and outer fifth of basal section of Cu_1. Venation: *Sc* long, Sc_1 ending about opposite midlength of *Rs*, Sc_2 retracted, Sc_1 alone nearly as long as *m-cu;* free tip of Sc_2 and R_2 in transverse alignment; cell *1st* M_2 subequal in length to distal section of vein M_3.

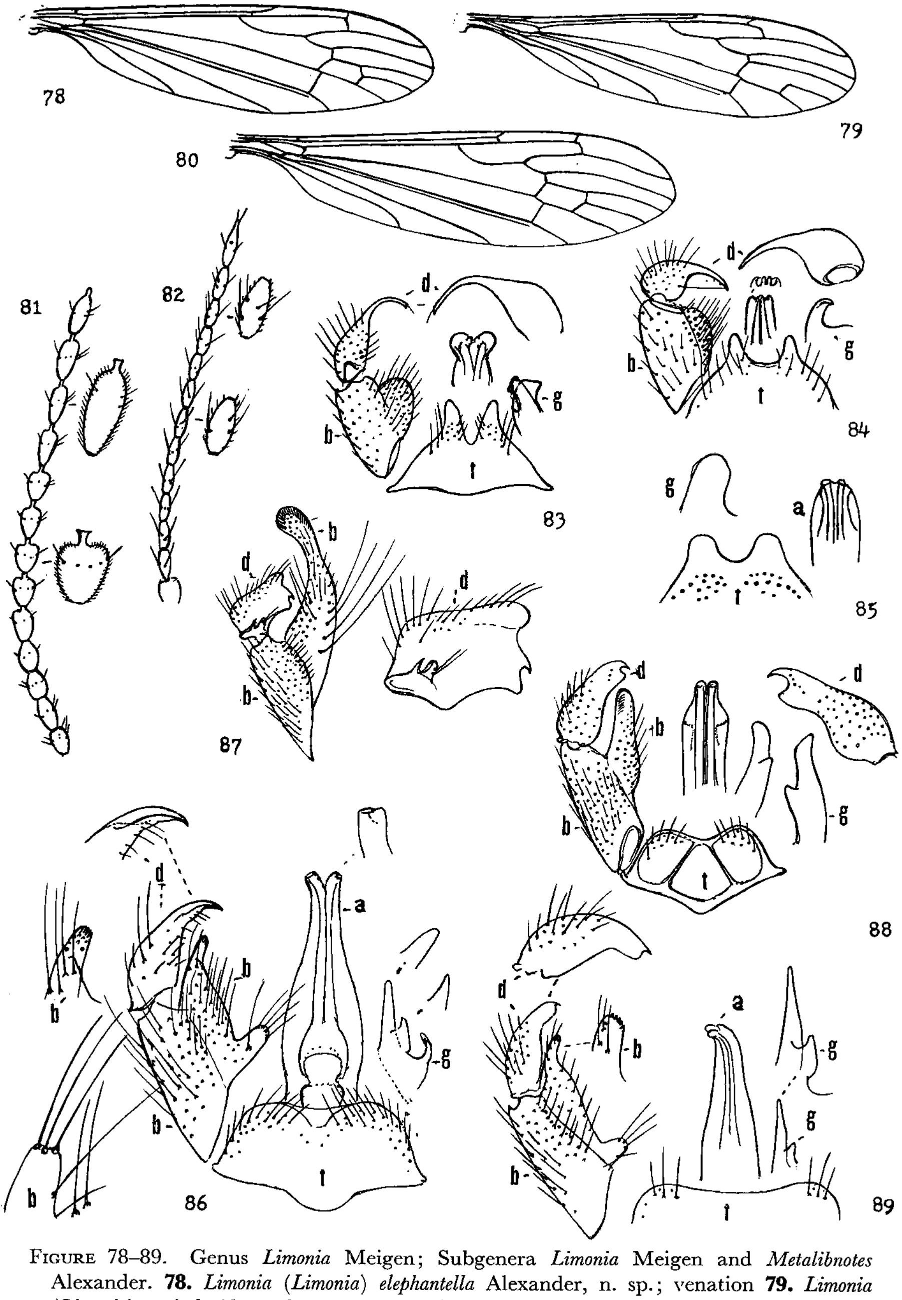

FIGURE 78–89. Genus *Limonia* Meigen; Subgenera *Limonia* Meigen and *Metalibnotes* Alexander. **78.** *Limonia* (*Limonia*) *elephantella* Alexander, n. sp.; venation **79.** *Limonia* (*Limonia*) *yapicola* Alexander, n. sp.; venation **80.** *Limonia* (*Metalibnotes*) *edgari* Alexander, n. sp.; venation **81.** *Limonia* (*Limonia*) *elephantella* Alexander; male antenna **82.** *Limonia* (*Limonia*) *elephantina* Alexander; male antenna **83.** *Limonia* (*Limonia*) *elephantella* Alexander, n. sp.; male hypopygium **84, 85.** *Limonia* (*Limonia*) *yapicola* Alexander, n. sp.; male hypopygium **86.** *Limonia* (*Metalibnotes*) *beardsleyi* Alexander, n. sp.; male hypopygium **87.** *Limonia* (*Metalibnotes*) *delandi* Alexander; male hypopygium **88.** *Limonia* (*Metalibnotes*) *edgari* Alexander, n. sp.; male hypopygium **89.** *Limonia* (*Metalibnotes*) *sentifera* Alexander, n. sp.; male hypopygium (Symbols: *a*, aedeagus; *b*, basistyle; *d*, dististyles; *g*, gonapophysis; *t*, ninth tergite).

Abdominal tergites and hypopygium brownish black, basal sternites yellow, outer two or three darker. Male hypopygium (fig. 83) with ninth tergite, *t*, large, transverse across base, narrowed outwardly to form narrow lobes that are separated by a slightly wider emargination, apices of lobes glabrous, obtuse. Basistyle, *b*, with ventromesal lobe obtuse. Dististyle, *d*, only about one-third as large as basistyle, narrowed into a long slender prolongation or beak, its apex obliquely truncated. Gonapophysis, *g*, small, bilobed, tips obtuse. Aedeagus terminating in two large obtuse lobes.

DISTRIBUTION: Caroline Is (Truk).

Holotype, male, (BISHOP 9781) Truk Is., Tol I., Mt. Uniböt, at light in lower native forest, Jan. 2, 1953, Gressitt. Allotopotype, female (BISHOP), with type. Paratopotype, male.

The only other regional member of the subgenus with cell *1st* M_2 of the wings closed is the smaller *Limonia* (*Limonia*) *elephantina* Alexander. This differs evidently in the short antennae with simple flagellar segments and in the details of the male hypopygium, as the broadly obtuse lobes of the tergite. The antennae of *elephantina* are shown for comparison (fig. 82). In addition to the non-pedicellate flagellar segments, attention is directed to the inconspicuous sparse flagellar pubescence and the longer and stronger verticils, those of the more proximal segments being only a little shorter than the segment.

34. **Limonia (Limonia) elephantina** Alexander (fig. 82)

Limonia (*Limonia*) *elephantina* Alexander, 1940, Annot. Zool. Japon., **19:** 207–208, fig. 5 (venation), fig. 17 (male hypopygium).

MALE: Length about 3.5 mm.; wing 4.2 mm.

General coloration of mesonotum medium brown, pleura testaceous yellow. Halteres and legs dark brown to brownish black. Wings pale brown, prearcular and costal fields more yellowed, stigma small, brown; Sc_2 far removed from tip of Sc_1. *m-cu* close to fork of *M*. Male hypopygium with dististyle single, extended into a trunklike prolongation; gonapophysis with mesal-apical lobe darkened, simple. Male antenna (fig. 82).

DISTRIBUTION: Caroline Is. (Ponape).

PONAPE: Nipit-Ninoani, Jan. 13, 1938, Esaki (KU, type).

35. **Limonia (Limonia) yapicola** Alexander, n. sp. (figs. 79, 84, 85)

Size small (wing of male to about 4.8 mm.); thorax chiefly yellow, mesonotum restrictedly patterned with darker, most evident on scutal lobes and cephalic half of mediotergite, pleura yellow with a narrow brown longitudinal stripe; legs brown; wings suffused with brown, stigma darker, cell M_2 open by the atrophy of *m;* male hypopygium with gonapophyses not blackened, aedeagus broad, terminating in small inconspicuous lobes.

MALE: Length about 3.6–4.2 mm.; wing 4–4.8 mm.

FEMALE: Length about 3.5–4 mm.; wing 3.7–4.5 mm.

Rostrum testaceous yellow, palpi with basal segment obscure yellow, remainder brownish black. Antennae black; basal flagellar segments oval, outer ones more elongate, all with short apical pedicels, terminal segment long, about one-half greater than the penultimate, narrowed outwardly; longest verticils subequal to the segments. Head dark brown; anterior vertex broad, exceeding the greatest diameter of scape.

Pronotum light brown. Mesonotal praescutum brownish yellow, somewhat clearer yellow sublaterally, margins vaguely darkened; centers of scutal lobes brown, remainder yellow; praescutal interspaces with long erect setae, more sparse on sides of scutal lobes. Pleura and pleurotergite yellow, paler ventrally, with a narrow conspicuous brown stripe extending from the fore coxae to abdomen, including the ventral anepisternum, central pteropleurite and lower pleurotergite. Halteres with stem dusky, base narrowly yellowed, knob dark brown. Legs with fore coxae darkened, as described, midcoxae weakly infuscated, posterior pair and all trochanters yellow; remainder of legs brown. Wings (fig. 79) strongly tinged with brown, prearcular field slightly darkened; stigma oval, darker brown; veins brown. Longitudinal veins beyond general level of origin of *Rs* with conspicuous macrotrichia, basad of this with fewer on veins *C*, *Sc*, and *R*. Venation: *Sc* relatively short, ending about opposite midlength of *Rs*, in the female available Sc_2 far retracted, Sc_1 alone being about two-thirds *Rs*, in the holotype male with free tip of Sc_2 more distad, before R_2, vein R_1 between these elements longer than either, in other specimens with Sc_2 in virtual transverse alignment with R_2; basal section of R_{4+5} long, from about two-thirds to three-fourths *Rs*; cell M_2 open by atrophy of *m*; *m-cu* shortly beyond fork of *M*, subequal to distal section of Cu_1; Anal veins convergent before midlength.

Abdominal tergites brownish black, sternites more yellowed, especially on their central parts, pleural membrane dimidiate, dark brown, with alternating yellow areas, the dark color being produced chiefly by longer and more numerous brown setulae. Ovipositor chiefly yellowed, clearest on basal sternal shield, proximal ends of hypovalvae black; cerci slender, gently upcurved to the acute tips. Male hypopygium (figs. 84, 85) with ninth tergite, *t*, transverse, slightly narrowed outwardly, terminating in two narrow lateral lobes that are separated by a broad U-shaped emargination, lobes glabrous, tips narrowly obtuse; tergal setae about 12 on either side, extended cephalad along sides almost to base of tergite, the inner pair small and weak. Basistyle, *b*, with ventromesal lobe very low, occupying virtually the entire mesal face of style, with abundant long setae. Dististyle, *d*, small, its area about two-fifths that of the basistyle, body oval, with long setae, prolongation long and slender, decurved to the acute tip. Gonapophysis, *g*, not conspicuously blackened, mesal-apical lobe obtuse at tip. Aedeagus, *a*, broad, terminating in small inconspicuous lobes, the internal pair smaller, not divergent as in *elephantella* and *elephantina*. A small paratype (Peleliu) differs in some regards, the tergal lobes, *t*, being broader, tips conspicuously obtuse, and with lobes of the gonapophyses likewise obtuse (fig. 85).

DISTRIBUTION: Caroline Is. (Palau, Yap).

Holotype, male, (US 72340) Yap I., Kolonia, June 21, 1957, Sabrosky. Allotopotype, female (US). paratopotype, male, June 13, 1957. Sabrosky. Paratypes (US, BISHOP, CM, ALEX), Palau Is., Babelthuap I., Airai, Ngerimal River, May 26, 1957, Sabrosky; Imeliik, Netkeng, June 5, 1957, Sabrosky; Ngaremeskang, alt. 25 meters, Dec. 30, 1952, Gressitt. Koror I., Malakal, May 2, 1957, Sabrosky. Peleliu I., east coast, August 1, 1945 (Dybas), CM.

Yap I., Chol, June 19, 1957, Sabrosky. Mt. Matade, 95 meters, Dec. 1, 1952, Gressitt.

The most similar regional species is *Limonia* (*Limonia*) *elephantina* Alexander, which differs evidently in the body coloration, as the darkened mesonotum and unstriped thoracic pleura, in the closed cell *1st* M_2 of the wings, and in hypopygial structure, particularly the gonapophyses and aedeagus.

Subgenus **Metalibnotes** Alexander, n. subgen.

Wing venation (fig. 80) of the general type found in *Goniodineura; Sc* long, Sc_1 ending about opposite three-fourths *Rs;* longitudinal veins beyond cord not decurved apically; *m-cu* beyond fork of *M,* at near one-third to one-fourth M_{3+4}*;* Anal veins parallel, not convergent. Longitudinal veins beyond general level of origin of *Rs* with trichia, on vein *2nd A* virtually basad to the arculus, lacking on *1st A.*

Male hypopygium (fig. 86–89) with posterior border of ninth tergite, *t,* shallowly emarginate, the lobes very low, with sparse setae. Basistyle, *b,* with ventromesal lobe conspicuous, narrowed outwardly, in *jocularis* with sparse setae to apex, in *delandi* and *edgari* with the lobe longer, relatively slender, near base with a group of very long pale setae, outwardly narrowed, the apex with parallel microscopic corrugations, subterminally with very small setae. Dististyle, *d,* single, apex simple to bidentate. Gonapophysis, *g,* with mesal-apical lobe narrowed outwardly, margin at near midlength with a toothlike extension. Aedeagus, *a,* relatively broad, basal lateral flanges distinct, apex with two small rounded lobes.

Type of subgenus—*Limonia* (*Metalibnotes*) *fijiensis* (Alexander) (*Teucholabis fijiensis* Alexander, 1914, Ann. Ent. Soc. America, **7:** 240. Type: Nadi, Fiji Is.).

Metalibnotes is one of three subgeneric groups described as new in the present paper that are separated from the older subgenus *Libnotes.* The type species, *fijiensis,* and two further species, *toxopei* Edwards and *veitchiana* Edwards, were included in *Libnotes* by Edwards in his comprehensive account of this group in 1928 (Jour. Fed. Malay States Mus., **14:** 74–80).

The following species are placed in *Metalibnotes:*

- *beardsleyi* Alexander, n. sp.—(Marshall Is.)
- *delandi* Alex.—(Santa Cruz Is., Vanikoro I.)
- *edgari* Alex., n. sp.—(Mariana Is.)
- *fijiensis* (Alex.)—(Fiji)
- *hebridensis* Edwards—(New Hebrides)
- *jocularis* Alex.—(Mariana, Caroline, Marshall Is.)
- *orofenae* Alex.—(Society Is.)
- *sentifera* Alex., n. sp.—(Marshall Is.)
- *toxopei* Edwards—(Buru)
- *veitchiana* Edwards—(Fiji)
- *watti* Alex.—(Kermadec Is.)

36. **Limonia** (**Metalibnotes**) **beardsleyi** Alexander, n. sp (fig. 86)

Allied to *jocularis;* antennae brownish black to black; mesonotum brownish yellow, praescutum with three dark brown stripes, pleura brownish yellow, patterned with dark brown; halteres yellow; legs yellow, femora with a light brown subterminal ring; wings yellow, patterned with brown, stigma of male very large, base of cell *1st* M_2 conspicuously arcuated; abdominal segments bicolored, yellow, bases dark brown; male hypopygium with outer end of dististyle a long simple point, mesal-apical lobe of gonapophysis narrowly obtuse.

Male: Length about 5–7 mm.; wing 6–7 mm.

Rostrum and palpi black. Antennae relatively long, brownish black to black; flagellar segments oval, outer ends narrowed into short pedicels, verticils stout, shorter than the segments; terminal segment slender, about one-third longer than the penultimate. Head with

the narrow anterior vertex and orbits yellow to light gray, remainder of vertex conspicuously brownish black, genae gray.

Pronotum dark brown, brownish yellow laterally. Mesonotal praescutum with sides brownish yellow, disk with three conspicuous dark brown stripes, central area broadest anteriorly, slightly more constricted before the lateral stripes; scutal lobes uniformly brownish black, lateral borders narrowly pale, median region and scutellum more silvery, posterior border of the latter brownish black; postnotum brownish black, sparsely gray pruinose. Pleura chiefly brownish yellow, conspicuously dark brown above, especially on propleura and dorsal sternopleurite, paler brown below. Halteres clear light yellow. Legs with fore and middle coxae light brown, posterior pair yellow; trochanters yellow; femora yellow with a light brown subterminal ring; remainder of legs chiefly yellow, outer three tarsal segments brown. Wings yellow, patterned with brown, stigma of male very large, long-oval; more restricted brown seams at origin of *Rs*, cord, outer end of cell *1st* M_2 and arculus, the latter area not reaching costa; prearcular and costal fields more yellowed, including the veins, remaining veins brown. Venation: Sc_1 ending about opposite three-fourths *Rs*, Sc_2 near its tip; *Rs* conspicuously arcuated at base; cell *1st* M_2 rectangular, base arched.

Abdominal segments bicolored, bases dark brown, remainder yellow, on subterminal segments the latter including slightly less than one-half; sternites yellowed, hypopygium pale brown. Male hypopygium (fig. 86) with ninth tergite, *t*, transverse, slightly narrowed outwardly, posterior border shallowly emarginate, each lobe with several long setae, Basistyle, *b*, with ventromesal lobe narrowed outwardly, apex blunt, with few setae and narrow longitudinal corrugations to produce small marginal points; lobe at proximal end of basistyle pale, relatively slender, with about nine very long setae. Dististyle, *d*, narrowed outwardly into a slender blade, apex a long point with an elevated ridge at its base. Gonapophysis, *g*, with mesal-apical lobe slender, tip narrowly obtuse, less truncated than in *jocularis*.

DISTRIBUTION: Marshall Islands.

Holotype, male, (BISHOP 9782) Namu A., Kaginen (Majkon) I., Oct. 25, 1953, Beardsley. Paratopotypes, 2 males, with type. Paratypes, male, Kili, Oct. 2, 1953, Beardsley; male, Namorik A., Namorik I., Sep. 30, 1953, Beardsley (US, BISHOP).

The species is named for Professor John W. Beardsley, of the University of Hawaii, who collected many specimens of Tipulidae in Micronesia. The fly is closely related to *Limonia* (*Metalibnotes*) *jocularis*, differing most evidently in hypopygial characters, including the dististyle and gonapophysis.

In order to complete the data I am including a description of the male hypopygium of *L.* (*M.*) *delandi* Alexander, not previously illustrated. Hypopygium (fig. 87) with basistyle, *b*, relatively small, shorter than its very long ventromesal lobe, apex of latter with unusually numerous delicate parallel corrugations; near base of lobe on outer face with a row of about four pale setae of unusual length, the longest approximately one-half as long as the lobe, on inner face with a concentration of shorter pale setae. Dististyle, *d*, very broad, lower apex above with a small decurved spine, at lower angle with a broader more rounded lobe; outer margin before apex with a further large rounded lobe; near base of style with a small acute spine and a slightly larger lobe bearing on margin two long slightly unequal setae.

37. Limonia (Metalibnotes) edgari Alexander, n. sp. (figs. 80, 88)

Allied to *jocularis;* mesonotum yellow, praescutum with three light brown stripes; head gray, anterior vertex narrow, more silvery; knobs of halteres infuscated; femora yellow with a brown subterminal ring; wings yellowed, stigma pale brown, much larger in male; abdominal segments conspicuously bicolored, dark brown basally, apices more narrowly yellowed; male hypopygium with apex of ventromesal lobe of basistyle subglabrous, with transverse striations; dististyle terminating in an outer spine, lower outer angle obtuse; gonapophysis with a basal flange.

MALE: Length about 3.5–6.5 mm.; wing 4.5–8 mm.; antenna about 1.2–2.2 mm.

FEMALE: Length about 5–6.5 mm.; wing 5–7 mm.

Rostrum and palpi dark brown. Antennae dark brown to black; basal flagellar segments short-oval, with abrupt apical pedicels, outer segments more elongate, with dense white pubescence and relatively short verticils. Head gray; anterior vertex narrow, silvery gray.

Pronotum buffy yellow, narrowly darkened medially. Mesonotal praescutum yellowish gray pruinose, with three light brown stripes; scutal lobes light brown, median region and scutellum testaceous; posterior sclerites of notum and the pleura yellowed. Halteres with stem yellow, knobs infuscated. Legs with coxae and trochanters light yellow; femora yellow with a pale brown subterminal ring; remainder of legs pale brownish yellow. Wings (fig. 80) yellowed, prearcular and costal fields clearer yellow; stigma pale brown, in male enlarged, approximately as long as *Rs*, in female small, short-oval; cord and outer end of cell *1st* M_2 narrowly seamed with pale brown, more evident in males; veins light brown, more yellowed in costal region. Macrotrichia on longitudinal veins beyond general level of *Rs* and on *C*, *Sc*, *R*, and outer end of *2nd A*. Venation: *Sc* long, Sc_1 ending about opposite two-thirds to three-fourths *Rs*, Sc_2 near tip; free tip of Sc_2 slightly basad of R_2, *Rs* arcuated; cell *1st* M_2 subrectangular, subequal to vein M_4; *m-cu* at near one-third M_{3+4}.

Abdominal tergites conspicuously bicolored, dark brown basally, the narrower apices yellow, sternites more uniformly yellow or very weakly bicolored; hypopygium infuscated. Male hypopygium (fig. 88) with ninth tergite, *t*, transverse, cephalic margin very convex, posterior border shallowly emarginate, each lobe with about a dozen setae; thickened margins and intermediate strut conspicuous. Basistyle, *b*, with ventromesal lobe elongate, apex darkened, transversely striate, base with very long setae, body of style with vestiture much shorter. Dististyle, *d*, about one-third as large as basistyle, outer apical angle produced into a slender spine, lower angle obtuse. Gonapophysis, *g*, with apex of mesal-apical lobe obliquely truncate, outer margin with a conspicuous basal flange. Aedeagus with apical lobes low, the genital ducts attaining the apex.

DISTRIBUTION: Mariana Islands.

Holotype, male, FM (CM). As Mahetog area, Saipan I. November 18, 1944, at light, S. A. Edgar. Allotopotype, female (FM), Dec. 2, 1944. Paratypes, Saipan; 1.2 miles east of Tanapag, Sep. 23, 1944—Jan. 5, 1945, Edgar & Dybas, and Ellsworth Hagen. Tinian, central section, Oct. 10–16, 1945, Dybas. Agana Airport, Guam, Aug. 15, 1945, broken male, Dybas (US, CM, BISHOP, ALEX).

The species is named for the collector, Mr. S. A. Edgar, who collaborated with Dybas in making important collections from September to December 1944.

The nearest relative appears to be *Limonia* (*Metalibnotes*) *jocularis*, from

which it differs chiefly in details of hypopygial structure, particularly the tergite, ventromesal lobe of basistyle, and the dististyle. The fly shows an unusual range in size in both sexes, as shown by the measurements provided.

38. **Limonia** (**Metalibnotes**) **jocularis** Alexander

Limonia (*Libnotes*) *jocularis* Alexander, 1940, Annot. Zool. Japon., **19:** 205–207, fig. 4 (venation), fig. 16 (male hypopygium).

MALE: Length about 6.5 mm.; wing 7 mm.

FEMALE: Length about 7 mm.; wing 6.5 mm.

General coloration of mesonotum buffy brown, praescutum with three conspicuous brownish black stripes, the median one more or less divided by a pale central line; pleura obscure yellow, variegated by darker brown, especially on the propleura, ventral sternopleurite and ventral anepisternum, in more heavily patterened materials, also on the pteropleurite and pleurotergite to produce a dorsal darkened stripe, dorsal sternopleurite of the ground color. Rostrum and antennae black; flagellar segments oval, with short apical pedicels, head dark gray. Halteres yellow. Legs yellow, femora with a relatively narrow dark brown subterminal ring, tibiae and tarsi yellow. Wings brownish yellow, sparsely patterned with brown; stigma darker brown, larger in male; vein *Sc* relatively short, *Rs* long, strongly arcuated; *m-cu* at from about one-third to one-half M_{3+4}; abdominal segments dimidiate, dark brown, the apices obscure yellow; male hypopygium with posterior border of tergite gently emarginate; basistyle with ventromesal lobe elongate, apex with about six parallel corrugations, base of style with a smaller lobe; dististyle narrowed outwardly into an acute spinous point; apex of gonapophysis obtuse; aedeagus terminating in two divergent flaps.

DISTRIBUTION: Mariana (Guam), Caroline (Ponape, Kusaie, Truk, Sorol), Marshall Islands (Arno).

Type from Ponape I., Carolines, Kolonia, Jan. 17, 1938, Esaki (KU).

MARIANA IS. GUAM: Fadian, Sep. 18, 1936 Swezey, 'ex rotten bark of dug-dug' (BISHOP).

KUSAIE. LELO: Dec. 3–11, 1937, Esaki (KU). TRUK. TON (TOL): Mt. Uniböt, Dec. 31, 1952, in lower native forest, Gressitt (BISHOP). PONAPE: Mt. Tamatamansakir, 180 meters, Jan. 19, 1953, Gressitt (US). SOROL A.: SOROL, Oct. 4, 1952, Krauss (US).

MARSHALL IS. ARNO A: Ine I., sweeping *Wedelia*, June 21, 1950, Ira LaRivers (BISHOP).

39. **Limonia** (**Metalibnotes**) **sentifera** Alexander, n. sp. (fig. 89)

Size small (wing male about 5 mm.); mesonotal praescutum and scutal lobes conspicuously patterned with brown, dorsal pleurites dark brown; halteres yellow; legs yellow, femora with a narrow brown subterminal ring; wing whitish subhyaline with a restricted darker pattern; male hypopygium with posterior border of tergite very shallowly emarginate, the low lateral lobes each with three major setae; mesal-apical lobe of gonapophysis unusually slender, apex nearly acute.

MALE: Length about 4–4.2 mm.; wing 4.8–5 mm.

FEMALE: Length about 5–5.2 mm.; wing 5–5.5 mm.

Rostrum, palpi and antennae black; flagellar segments short-oval, with short abrupt apical

pedicels; verticils stout. Head light gray pruinose, more brownish black behind; anterior vertex very narrow, clear light gray.

Pronotum light brown, more or less variegated with yellow, especially the scutellum. Mesonotal praescutum laterally light yellow to brownish yellow, disk with three conspicuous brown stripes, the central one vaguely paler medially, not reaching the suture behind; posterior sclerites of notum light brown, scutal lobes darker brown, postnotum more yellowed. Pleura dark brown above, sternopleurite and posterior sclerites paler brown. Halteres yellow. Legs with fore coxae brown, remaining coxae and all trochanters yellow; femora yellow with a narrow brown subterminal ring, tibiae and tarsi yellow, outer three segments medium brown; claw long and slender, with a long basal spine and reduced points nearer base. Wings whitish subhyaline, stigma of male long-oval, light brown; paler brown markings at origin of *Rs*, in cases reaching vein *M* behind, a seam in cell *R* adjoining vein *Cu*, and the broad wing tip; arcular region restrictedly darkened; certain specimens, including the holotype have the darkened pattern more restricted; veins dark brown, more yellowed in prearcular and costal fields. Veins beyond general level of origin of *Rs* with abundant trichia. Venation: Sc_1 ending about opposite five-sixths *Rs*, Sc_1 and Sc_2 subequal; *Rs* long, in alignment with R_{2+3}; inner end of cell *1st* M_2 arcuated; *m-cu* shortly before midlength of M_{3+4}.

Abdominal tergites dark brown, in female the proximal segments slightly paler apically; basal sternites more yellowed, darker posteriorly; subterminal segments uniformly darker brown to form a ring, outer segments yellowed, hypopygium slightly more darkened. Male hypopygium (fig. 89) with ninth tergite, *t*, narrowly transverse, posterior border very shallowly emarginate, lateral lobes scarcely produced, each with three major setae, with two or three smaller ones. Basistyle, *b*, with ventromesal lobe narrowed outwardly, apex obtuse, with sparse microscopic points or roughenings. Dististyle, *d*, with rostral prolongation a compressed-flattened yellow blade, the outer apical angle a small spine. Gonapophysis, *g*, with mesal-apical lobe unusually slender, the apex nearly acute.

DISTRIBUTION: Marshall Islands (Namu).

Holotype, male (BISHOP 9783), Kaginen (Majkon) I., Namu A., Oct. 25, 1953, Beardsley. Allotopotype, female (BISHOP). Paratopotypes, one male, one female. Paratypes, one male, Arno A., Arno I., July 15, 1952, Beardsley; one male, with the last, on *Randia cochinchinensis* (Rubiaceae), P. H. Hathaway (US, BISHOP, ALEX).

The most similar species is *Limonia* (*Metalibnotes*) *beardsleyi* which differs in slight details of wing coloration and especially in the structure of the hypopygium.

Subgenus **Nealexandriaria** Alexander

Limonia (*Nealexandriaria*) Alexander, 1966, Philip. J. Sci., **95:** 107–108 (type: *tecta* Alexander). (nec *Alexandriaria* Garrett, 1922, Proc. Ent. Soc. Washington, **24:** 60 (type: *suffusca* Garrett)).

Nealexandriaria includes approximately a score of species, widely distributed throughout the Oriental and Australasian regions. The species first described were assigned to *Alexandriaria* Garrett (Nearctic) but now are recognized as being in a distinct group.

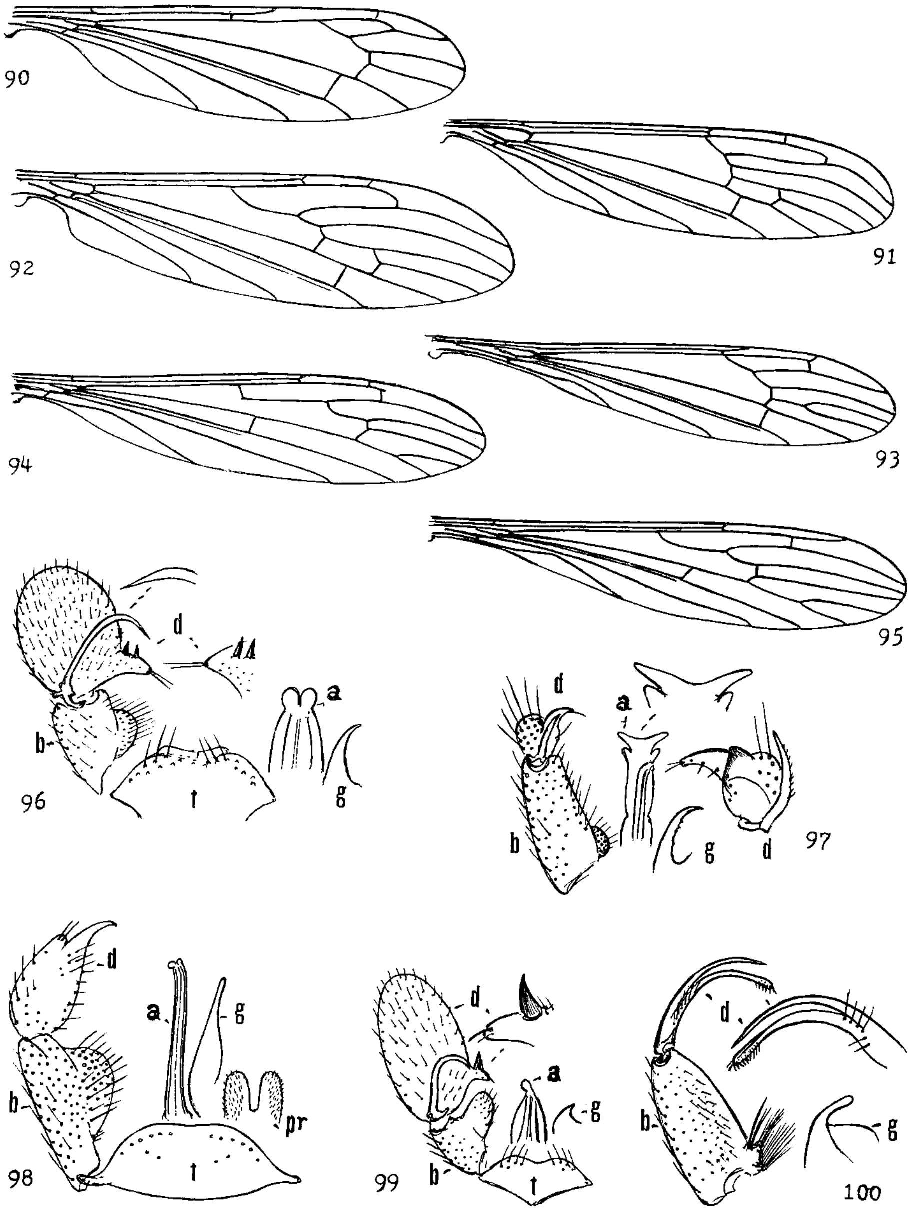

FIGURE 90–100. Genus *Limonia* Meigen; Subgenera *Nealexandriaria* Alexander, *Neolibnotes* Alexander, *Paralibnotes* Alexander, and *Pseudoglochina* Alexander; genus *Orimarga* Osten Sacken. **90.** *Limonia* (*Nealexandriaria*) *cinereicapilla* Alexander; venation **91.** *Limonia* (*Neolibnotes*) *biprotensa* Alexander, n. sp.; venation **92.** *Limonia* (*Paralibnotes*) *bidentoides* Alexander, n. sp.; venation **93.** *Limonia* (*Pseudoglochina*) *ponapensis* Alexander; venation **94.** *Orimarga* (*Orimarga*) *palauiana* Alexander; venation **95.** *Orimarga* (*Orimarga*) *perextensa* Alexander, n. sp.; venation **96.** *Limonia* (*Nealexandriaria*) *cinereicapilla* Alexander; male hypopygium **97.** *Limonia* (*Neolibnotes*) *biprotensa* Alexander, n. sp.; male hypopygium **98.** *Limonia* (*Paralibnotes*) *bidentoides* Alexander, n. sp.; male hypopygium **99.** *Limonia* (*Pseudoglochina*) *ponapensis* Alexander; male hypopygium **100.** *Orimarga* (*Orimarga*) *perextensa* Alexander, n. sp.; male hypopygium (Symbols: *a*, aedeagus; *b*, basistyle; *d*, dististyles; *g*, gonapophysis; *t*, ninth tergite).

Characters generally as in *Dicranomyia* Stephens, differing especially in the venation, with cell M_2 open by the atrophy of veins *m* and both sections of M_3, the remaining veins of Media being M_{1+2} and M_4 (fig. 90). Vein *Sc* short, longest in species such as *injucunda* Alexander where it ends nearly opposite the origin of *Rs*. Male hypopygium (fig. 96) nearly as in *Dicranomyia* with two dististyles, *d*, including a long slender dorsal style, ventral dististyle commonly with two rostral spines, as shown; in the subgenotype, *tecta* Alexander, with a single such spine.

The Australasian species are as follows:

anisota Alexander—(Fiji)
atromaculata (Edwards)—(Samoa)
cinereicapilla Alex.—(New Guinea, Micronesia)
conveniens (Walker)—(New Zealand)
fulvicolor Alex.—(Solomon Is.)
ochricapilla Alex.—(Fiji)
scolopia Alex.—(Tonga)
semirufa (Edwards)—(New Hebrides)

40. Limonia (Nealexandriaria) cinereicapilla Alexander (figs. 90, 96)

Limonia (*Alexandriaria*) *cinereicapilla* Alexander, 1934, Philip. J. Sci., **54:** 452–453, fig. 13 (wing); 1940, Annot. Zool. Japon., **19:** 211, fig. 7 (wing).

MALE: Length about 4.5 mm.; wing 5 mm.

FEMALE: Length about 5.8–6 mm.; wing 5.6–5.8 mm.

General coloration of entire body pale yellow or reddish yellow. Antennae with basal segments yellow, outer flagellar segments darkened. Head silvery white.

Halteres and legs yellow; claws small, simple. Wings (fig. 90) with veins beyond general level of fork of *Rs* with macrotrichia, lacking on *Sc*, *Rs*, and *1st A*, very sparse on outer ends of *M*, basal section of Cu_1 and *2nd A*. Venation: *Sc* with Sc_1 ending far before origin of *Rs*, Sc_2 retracted, Sc_1 alone about one-half to nearly equal to *Rs*; *m-cu* at or shortly before fork of *M*, about as long as distal section of Cu_1.

Male hypopygium (fig. 96) with dorsal dististyle, *d*, unusually long and slender, gently curved to the very long needlelike tip; ventral style with rostral prolongation stout, tipped with two very long setae; rostral spines unusually short and stout separated from one another by a distance about equal to their basal diameter. Gonapophysis, *g*, with mesal-apical lobe nearly straight, narrowed gradually to the acute tip. Aedeagus, *a*, with apex bilobed.

Type, female, from Seleo, Berlinhafen, New Guinea, collected in 1896 by Ludwig Biro (1856–1931). The male sex is not known from the type locality and there is the possibility that when such are made known, they may prove to be different from the specimens here considered from western Micronesia. These latter materials are very similar to the type female and the determination is presumed to be correct.

DISTRIBUTION: New Guinea, southern Micronesia.

PALAU. BABELTHUAP, Marukyoku, Feb. 23, 1936, Esaki (KU); Mele-

keiok, May 22–24, 1957, at light, Sabrosky (US, BISHOP); Ngiwal, alt. 1 meter, Dec. 16, 1952, light trap, Gressitt (BISHOP), fragment. Males, at light, May 19, 1957, Sabrosky (US). Female, Kayangel A., Ngajangel, Dec. 15, 1952, light trap, Gressitt (BISHOP). PELELIU: north central, Aug. 12. 1945, Dybas (CM).

KUSAIE: Lelo (Lele), Dec. 4, 1937, Esaki (KU). YAP. RUMUNG I., June 17, 1957, at light, Sabrosky (US).

Subgenus **Neolibnotes** Alexander, n. subgen.

Wing venation (fig. 91) of the general type of *Libnotes*, with outer radial veins strongly decurved, *Sc* short, Sc_1 ending about opposite or just beyond fork of *Rs*, the latter short and straight, in male in alignment with other elements of cord, or approximately so, in *subaequalis* subequal in length to basal section of R_{4+5}. Veins in stigmal region with free tip of Sc_2 some distance before R_2, with R_{1+2} in cases preserved as a short to longer spur that does not reach the margin, the spur shortest in *biprotensa*. Outer radial veins in male strongly decurved to wing apex or beyond, as in typical *Libnotes*, medial branches straight or virtually so; cell *1st* M_2 rectangular, with *m* and basal section of M_3 in virtual transverse alignment, the former slightly more arcuated; *m-cu* far beyond fork of *M*, at near one-third to one-half M_{3+4}.

Male hypopygium (fig. 97) with two dististyles, most resembling *Paralibnotes*, especially in the shape of the ventral dististyle. Tergite transversely oval in outline, lateral ends extended into acute points, posterior border strongly convex, the relatively few setae slightly removed from margin, anterior border more rounded and strongly produced. Basistyle, *b*, long, the unusually small and low ventromesal lobe nearly basal in position, with relatively sparse long setae. Dorsal dististyle, *d*, a short darkened nearly straight spike, tip acute; ventral style with body small, with relatively few but very long setae; rostral prolongation large, more or less compressed, narrowed and curved to the obtuse tip that bears two unusually long setae; no rostral spines or modified lobe at base of prolongation, as in subgenus *Libnotes*. Gonapophysis, *g*, with mesal-apical lobe a long nearly straight spine, tip acute. Aedeagus, *a*, relatively broad, lateral flanges broad, genital openings subterminal, the apex of organ farther produced into a conspicuous central plate that provides strong specific characters, in *manni* shield-shaped with outer lateral angles not or only slightly produced, in *biprotensa* with the angles extended laterad into conspicuous horns or points.

Type of subgenus—*Limonia* (*Neolibnotes*) *samoensis* (Alexander) *Libnotes samoensis* Alexander, 1921, Bull. Brooklyn Ent. Soc. **16:** 9–10. Type: Samoa.

The following species pertain to this subgenus:

biprotensa Alexander, n. sp.—(Palau I.)
immaculipennis (Senior-White)—(Ceylon) (synonym *nervosa* de Meijere, 1911: 36, see below)
manni (Alex.)—(Solomon Is.)
obliqua (Alex.)—(Australia; North Queensland)
samoensis (Alex.)—(Samoa)
subaequalis (Alex.)—(Australia: North Queensland)

The nomenclature and synonymy in this subgenus is confused. In 1911 (Tijdschr. Ent., 54: 26, 36) de Meijere described two species of *Limonia* under the specific name *nervosa* (as *Dicranomyia nervosa*, p. 26; *Libnotes nervosa*, p. 36), both names being preoccupied by the earlier *nervosa* Schummel, 1829. The

former of these two names presently is recognized as *Limonia* (*Libnotes*) *recta* Edwards, the latter name as *Limonia* (*Neolibnotes*) *immaculipennis* (Senior-White), as above. Edwards (Jour. Fed. Malay States Mus., 1928, **14:** 85) has suggested that *Limonia* (*Libnotes*) *parvistigma* (Alexander) might belong to this particular group of species but it now is placed in *Goniodineura* van der Wulp.

41. Limonia (Neolibnotes) biprotensa Alexander, n. sp. (figs. 91, 97)

Allied to *immaculipennis;* size small (wing of male about 5–6.5 mm.); mesonotal praescutum obscure yellow with a slightly darker central stripe, pleura yellow; femora and tibiae uniformly dark brown; wings pale brown, the large stigma in the male darker brown, vein *Sc* short, cell *1st* M_2 long-rectangular; male hypopygium with the dorsal dististyle sparsely setiferous; gonapophysis with mesal-apical lobe long and slender, margin with microscopic denticles; aedeagus terminating in two divergent horns.

MALE: Length about 5–6.5 mm.; wing 5–6.8 mm.; antenna about 1.1–1.4 mm.

FEMALE: Length about 5 mm.; wing 5.5 mm.

Rostrum and palpi black, terminal segment of latter slightly paler. Antennae black; basal flagellar segments oval, with conspicuous abrupt apical pedicels, outer segments more elongate, the terminal about one-fourth longer than the penultimate; longest verticils unilaterally distributed, about one-half longer than the segments. Head brown, front and anterior vertex silvery, the latter very narrow, scarcely broader than a single row of ommatidia.

Pronotum dark brown, yellowed on sides. Mesonotal praescutum obscure yellow with a slightly darker central stripe, very narrowly more darkened at anterior end; scutal lobes yellowish brown, central area, scutellum and postnotum more yellowed. Pleura yellow. Halteres dark brown. Legs with coxae and trochanters light yellow; femora and tibiae dark brown throughout, tarsi paling to brownish yellow or obscure yellow; claw with a single very long spine. Wings (fig. 91) pale brown, stigma in male very large, darker brown, approximately one-fourth the wing length, extending from shortly beyond fork of *Sc* to beyond R_2, in female, stigma small and normal; veins brown, cord darker. Macrotrichia on longitudinal veins beyond cord, more basally on *C*, *Sc*, *R*, outer third of *M* and the extreme tips of both Anals. Venation: *Sc* short, Sc_1 ending just beyond origin of *Rs* to slightly more distad, Sc_2 near its tip; free tip of Sc_2 perpendicular, pale, far before R_2, R_{1+2} continued beyond R_2 as a short pale spur; cord oblique, *Rs* about one-half longer than basal section of R_{4+5}; outer radial branches moderately decurved, R_3 ending near wing tip, cell *1st* M_2 long-rectangular, about equal in length to vein M_4; *m* shorter than basal section of M_3, *m-cu* before midlength of M_{3+4}; Anal veins gently convergent beyond origins.

Abdominal tergites brown, intermediate sternites bicolored, brown and yellow, outer segments and hypopygium more uniformly darkened. Male hypopygium (fig. 97) with basistyle, *b*, long, ventromesal lobe a low basal cushion. Dorsal dististyle, *d*, a nearly straight rod, tip acute, surface with scattered setae; ventral style very small, its area only about one-fourth that of basistyle; rostral prolongation conspicuous, with a basal darkened collar or flange. Gonapophysis, *g*, with mesal-apical lobe long and slender, nearly straight, tip acute, lower margin with few microscopic denticles. Aedeagus, *a*, distinctive, apex beyond the genital apertures produced laterad into two divergent horns with smaller lobes at their bases.

DISTRIBUTION: Caroline Is. (Palau).

Holotype, male (US 72341), Palau Is., Babelthuap I., Ngiwal, May 21, 1957, Sabrosky. Allotype, female FM (CM), Palau Is., Peleliu I., Aug. 12, 1945, Dybas. Paratypes, male, with allotype, Aug. 11, 1945, Dybas; male,

Babelthuap, Ngaremlengu, June 4, 1957, Sabrosky; male, Babelthuap, Ngerehelong, May 7, 1957, Sabrosky; male, Koror, Jan. 12, 1953, Beardsley (US, BISHOP, CM, ALEX).

Most readily told from other allied species by the uniformly darkened femora and tibiae and in the hypopygial structure, particularly the aedeagus. The paratype from Koror is the smallest in the type series, differing also in the more unicolorous wings with the stigmal area in the male small, almost as in the females. Its hypopygial structure is so like that of the type that I am placing it with this species despite these differences.

Subgenus **Paralibnotes** Alexander, n. subgen.

Wing venation (fig. 92) of the general type of *Goniodineura; Sc* long, ending opposite or just before fork of *Rs;* longitudinal veins beyond cord not decurved outwardly; *m-cu* beyond fork of *M,* about opposite or shortly before midlength of M_{3+4}; Anal veins parallel.

Male hypopygium (fig. 98) with posterior border of tergite, *t*, moderately convex. Basistyle, *b*, with ventromesal lobe large and flattened, with long setae throughout. Dististyle, *d*, single, narrowed outwardly into a long slender prolongation; setae of style long but very sparse. Gonapophysis with mesal-apical lobe narrowed gradually into a long straight point. Aedeagus, *a*, long and very slender, lateral flanges virtually lacking; apex with two small rounded lobes.

Type of subgenus—*Limonia* (*Paralibnotes*) *bidentata* (Skuse) *Limnobia bidentata* Skuse, 1890, preprint 1889, Proc. Linn. Soc. New South Wales, 2, **4:** 702–703, fig. 51 (male hypopygium).

The following species pertain to this subgenus:

bidentata (Skuse)—(SE Australia)
bidentoides Alexander, n. sp.—(Palau Is.)
brunettii Alex. (*nigra* Brunetti, preoccupied)—(India)
mopsa Alex.—(New Guinea)

42. **Limonia** (**Paralibnotes**) **bidentoides** Alexander, n. sp. (figs. 92, 98)

Allied to *bidentata;* thoracic dorsum brown and yellow, praescutum with three light brown stripes, pleura clear light yellow; halteres infuscated; legs light brown, claw with a single spine, basal in position; wings faintly tinged with darker, cells *C* and *Sc* light brown, without stigmal darkening; free tip of Sc_2 far before level of R_2, the intervening vein R_1 longer than *m-cu*, the latter shortly beyond midlength of M_{3+4}; male hypopygium with the small dististyle oval, at apex produced into a slender beak; aedeagus very slender.

MALE: Length about 5.8–6.5 mm.; wing 6–7 mm.

FEMALE: Length about 6.5–8 mm.; wing 6.5–6.8 mm.

Rostrum black, relatively long; palpi black. Antennae black; basal flagellar segments oval, outer ones longer, terminal segment more than one-half longer than the penultimate. Head dark gray behind, more silvery gray anteriorly; vertex in front very narrow, in male equal to about two rows of ommatidia or approximately one-fourth the diameter of scape, in female still narrower, only slightly exceeding a single ommatidium in width.

Pronotum brownish yellow. Mesonotal praescutum yellow laterally, disk with three light brown stripes, the broad central area darker, lateral pair poorly indicated; posterior sclerites of notum brown, yellowed on posterior ends of scutal lobes, midregion of scutum, parascutella

and pleurotergite. Pleura with coxae and trochanters, clear light yellow. Halteres infuscated, base of stem yellowed. Legs light brown; claw with a single very long basal spine, tip obtuse. Wings (fig. 92) faintly tinted, cells *C* and *Sc* light brown, stigma not differentiated; veins brown. Venation: *Sc* long, Sc_1 ending shortly beyond fork of *Rs*, Sc_2 at its tip; free tip of Sc_2 some distance before R_2, vein R_1 between these longer than *m-cu*, provided with several trichia; cell *1st* M_2 long-rectangular, slightly widened outwardly, *m-cu* shortly beyond midlength of M_{3+4}; Anal veins at bases virtually parallel.

Abdominal tergites dark brown, sternites and hypopygium light brown, in female, subgenital segments light brown, bases of hypovalvae blackened; valves of ovipositor elongate, cerci very slender, gently upcurved to the acute tips. Male hypopygium (fig. 98) with ninth tergite, *t*, transverse, posterior border convex; setae large, relatively sparse, arranged chiefly in a single transverse row. Proctiger, *pr*, appearing as two flattened pale lobes provided with abundant microscopic setulae. Basistyle, *b*, elongate, ventromesal lobe large, only slightly elevated, with numerous setae. Dististyle, *d*, single, oval, narrowed into a slender beak, its tip acute, on outer margin before beak with a small lobe bearing two or three strong setae. Gonapophysis, *g*, a narrow blade, outwardly narrowed gradually into a slender point, tip narrowly obtuse. Aedeagus, *a*, very slender, as compared with *bidentata*.

DISTRIBUTION: Caroline Is. (Palau).

Holotype, male (US 72342), Palau, Is., Malakal I., May 2, 1957, Sabrosky. Allotype, female (US), Babelthuap I., Ngaremlengui, June 2, 1957, Sabrosky. Paratopotype, one male, with the holotype. Paratypes, Palau Is. Auluptagel (Aurapushekaru) I., Sep. 1952, Krauss. Babelthuap I., Imeliik, Netkeng, June 5–6, 1957, Sabrosky; one male, four females on spider web; one broken male, in cacao plantation, Aug. 26, 1953, Beardsley. Ngerehelong, May 7, 1957, Sabrosky; Ngatpang, east, 65 meters, Dec. 8, 1952, Gressitt; Ngiwal, May 21, 1957, Sabrosky. Koror I. on limestone cliff "on spider web", April 25, 1957, Sabrosky. Peleliu I., east coast, Aug. 1, 1945, Dybas (US, BISHOP, CM, ALEX).

Limonia (*Paralibnotes*) *bidentoides* differs from the subgenotype and other species listed above in the details of coloration of the body and wings, venation, especially the position of the free tip of Sc_2, and in slight hypopygial characters.

Subgenus **Pseudoglochina** Alexander

Libnotes (*Pseudoglochina*) Alexander, 1921, Canad. Ent., **53:** 208 (Type: *pulchripes* Alexander), 1929, Philip. J. Sci. **40:** 243.

Pseudoglochina includes a small number of Oriental species (about 16) with fewer in the Australasian region (about 7).

The chief subgeneric characters are found in the venation and the conformation of the wing. Wings strongly narrowed and petiolate at base, with the arculus some distance beyond the other elements that comprise the basal cord (fig. 27, 28, 93). The reduction in size of cell *2nd A* has been discussed under the account of *Doaneomyia*. Vein *Sc* short, Sc_1 ending opposite to shortly beyond the origin of *Rs;* elements comprising the anterior cord short and oblique in position; cell M_2 open by atrophy of basal section of M_3; *m-cu* usually at or close to fork of *M*, in *procella*

nearly its own length beyond the fork; vein Cu_2 long.

Legs chiefly white, tibiae commonly with brown rings, in cases with a single very broad annulus, in other species with two narrower rings. Still other species have a single darkened tibial ring, in cases very narrow, in still others, as *procella* Alexander, lacking.

Male hypopygium (fig. 99) generally as in *Dicranomyia*, with two dististyles. Dorsal style, *d*, long and very strongly bent beyond midlength; ventral style commonly with a single rostral spine, in cases with two such spines (as in *microneura* and others).

As discussed under *Doaneomyia*, this subgenus and *Pseudoglochina* appear to be the most nearly related.

The Australasian species are as follows:

evanescens Alexander—[New Guinea (Admiralty Is.)]
fuscolata Alex.—(British Solomon Is.)
hoskingi Alex.—New Guinea, New Britain
laticincta (Edwards)—(Western Samoa Is.)
microneura Alex.—(New Caledonia)
ponapensis Alex.—(Caroline Is.)
procella Alex.—New Guinea, New Ireland
pulchripes Alex.—(North Queensland)

43. **Limonia (Pseudoglochina) ponapensis** Alexander (figs. 27, 93, 99)

Limonia (*Pseudoglochina*) *ponapensis* Alexander, 1940, Annot. Zool. Japon., **19:** 211–212, fig. 8 (venation).

MALE: Length about 5.5–6 mm.; wing 6–6.5 mm.

FEMALE: Length about 7 mm.; wing 5.5 mm.

Rostrum and palpi dark brown. Antennae black throughout; flagellar segments fusiform, apical pedicels well developed, verticils exceeding the segments. Head yellow, vertex with a transverse brown area.

Pronotum dark brown, paler laterally. Mesonotum uniformly brownish black, the color including dorsal parts of the pteropleurite and pleurotergite. Pleura blackened ventrally, leaving a broad orange yellow longitudinal stripe that extends from sides of pronotum to base of abdomen, passing below the halteres and including the posterior coxae. Halteres black, stem slightly more dusky. Legs with fore and middle coxae blackened, trochanters testaceous yellow; fore femora blackened, base narrowly pale, remaining femora obscure yellow, tips rather narrowly blackened; tibiae white, each with two relatively broad black rings, the more basal one slightly narrower, subequal in extent to the pale interspace, outer black ring about equal to the whitened apex; tarsi white. Wings (figs. 27, 93) with a weak dusky tinge, cells *C* and *Sc* slightly darker, stigma oval, darker brown; veins black. Venation: *Sc* relatively long, Sc_1 ending shortly before fork of the short oblique *Rs*, Sc_2 opposite origin of *Rs;* cell *2nd* M_2 deep, approximately three times its petiole; *m-cu* a short distance beyond fork of *M;* vein *2nd A* moderately long.

Abdominal tergites dark brown, basal sternites light yellow, outer segments weakly infuscated. Male hypopygium (fig. 99) with ninth tergite, *t*, small, posterior border shallowly emarginate, lobes very low, with long setae. Basistyle, *b*, small, ventromesal lobe relatively large. Dorsal dististyle, *d*, a strongly curved sickle; ventral style very large, its area about four times that of the basistyle; rostral prolongation small, apex obtuse, with a single very powerful hornlike spine. Gonapophysis, *g*, with mesal-apical lobe broadly triangular, tip acute. Aedeagus, *a*, broad, apex simple.

The above description is based on the type (Caroline Islands). The additional specimens from the Palau Islands differ in certain regards but are considered to be conspecific. Mesonotum almost uniformly medium brown, not as dark as in type and not involving the pteropleurite and pleurotergite, the yellow pleural area thus very extensive, mesosternal darkening involving the fore coxae. Tips of fore femora more narrowly and abruptly brownish black, involving the outer fifth or less; middle femora yellowish brown, tips very narrowly brownish black, preceded by a subequal slightly more yellowed ring. Wings with long macrotrichia on veins beyond general level of origin of *Rs*, lacking on *Sc* and both Anals, present on nearly the outer half of *M* and outer end of basal section of Cu_1.

DISTRIBUTION: Caroline Is. (Palau, Ponape)

PONAPE: Kolonia, Jan. 1, 1938, Esaki (KU), type. PALAU. PELELIU: 3 males, 1 female, east coast, July 29—Aug. 1, 1945, Dybas (CM).

Subgenus **Thrypticomyia** Skuse

Thrypticomyia Skuse, 1890, preprint 1889, Proc. Linn. Soc. N. S. W. Ser., 2, **4:** 774 (type: *aureipennis* Skuse)

Limonia (*Thrypticomyia*) Alexander, 1929, Philip. J. Sci. **40:** 242, 245.

About 34 species of the subgenus are known, all Palaeotropical, including about 23 Australasian, 9 Oriental, and 2 Ethiopian. The most southeasterly species is the subgenotype, *aureipennis* (Skuse) described from New South Wales, the most westerly being *nigeriensis* (Alexander), from West Africa.

The Australasian species are as follows:

arachnophila Alexander—[Oriental, Australasian (to New Britain, New Hebrides, New Guinea, Solomons)]
arcus Alex.—(New Guinea)
aureipennis (Skuse)—[Eastern Australia (New South Wales)]
basitarsatra Alex.—(New Caledonia)
carissa Alex.—(New Guinea)
carolinensis Alex.—(Micronesia to Solomons)
decussata Alex., n. sp.—[Micronesia (Carolines)]
dichaeta Alex.—(New Hebrides)
dichromogaster (Edwards)—[Society Is. (Tahiti)]
doddi Alex.—[Australia (North Queensland)]
fumidapicalis (Alex.)—[Australia (North Queensland)]
marksae Alex.—[Australia (North Queensland)]
microstigma Alex.—[Australia (North Queensland), Solomon Is.]
ponapicola Alex., n. sp.—[Micronesia (Carolines)]
sparsiseta Alex.—[Society Is. (Tahiti)]
spathulata Alex.—[Solomon Is. (Santa Cruz I.)]
spathulifera Alex.—[New Guinea (Admiralty Is.)]
subsaltens Alex.—(Fiji, New Caledonia)

tetrachaeta Alex., n. sp.—[Micronesia (Palau Is.)]
tinianensis Alex., n. sp.—[Micronesia (Mariana Is.)]
trifusca Alex.—(Solomon Islands)
unisetosa perelongata Alex., n. subsp.—[Micronesia (Bonin Is.)]
zimmermaniana Alex.—[Austral Is. (Tubuai I.)]

The chief characters used for separation of the species are the venation and especially the hypopygial structure.

Wings (figs. 31, 101–103) with vein *Sc* short, Sc_1 ending opposite or shortly beyond origin of *Rs*, the latter generally long. Free tip of Sc_2 distinct, placed a short to longer distance before vein R_2, R_{1+2} projecting beyond as a spur; cell *1st* M_2 closed, commonly with *m-cu* at near midlength. A further character that separates the subgenus from others in *Limonia*, with the exception of *Euglochina*, is the total loss of vein Cu_2 and the absence of microtrichia in the wing cells. Other allied and generally similar subgenera such as *Doaneomyia* and *Pseudoglochina* have the microtrichia present but minute and visible only under a high power microscope. In a further member of this group of subgenera, *Euglochina*, the microtrichia area present in most species but are lacking in *yorkensis* Alexander.

The free tip of vein Sc_2 was stressed by Skuse in his definition of the present group, by him being considered as being "a supernumerary cross-vein between the costa and the auxiliary vein", the latter words being a lapsus for the first longitudinal vein (*R* instead of *Sc*).

Limonia (*Thrypticomyia*) *marksae*, described from Low Island, Great Barrier Reef, is markedly aberrant in the venation, including the veins in the stigmal region, and especially those elements that comprise the basal cord of the wing, but conforms more closely with *Thrypticomyia* in hypopygial structure. Despite the important differences noted, it appears advisable to retain this species in *Thrypticomyia*, at least for the present, but future studies may require its removal to a still different undefined group in *Limonia*. *L.* (*T.*) *ponapicola* similarly deviates rather widely from the presently accepted venational characters in *Thrypticomyia*.

Male hypopygium (figs. 104–110) provides strong characters in the different species, including especially the tergite, basistyle and its ventromesal lobe, the ventral dististyle, and the aedeagus. The rostral prolongation of the ventral style commonly bears two spines, but in *L.* (*T.*) *monocera* Alexander, of Java there is a single very long straight spine that exceeds the prolongation in length.

Association with spiders. As has been discussed briefly earlier in the present paper, there have been several accounts of the occurrence of species of *Thrypticomyia* with spiders, including the following.

Limonia (*Thrypticomyia*) *arachnophila*—"the fly rests with the tips of the fore tarsi on a spider web line and dances, three or four flies sometimes resting together on a line". —McGregor, Philippines. (Alexander, 1927, Philip. J. Sci., 33: 299)

Limonia (*Thrypticomyia*) *marksae* Alexander—"Dr. Elizabeth N. Marks discovered this fly on the Great Barrier Reef, North Queensland, living at the edge of the mangroves where it was found while dancing on the webs of a spider, *Gasteracantha*". (Alexander, 1956, Ann. Mag. Nat. Hist., 12, **9:** 43)

Limonia (*Thrypticomyia*) *seychellensis* (Edwards)—"Found in shady places in the mountain forests; a number of specimens often hang by their front tarsi in rows, suspended from threads of webs stretched between bushes",—

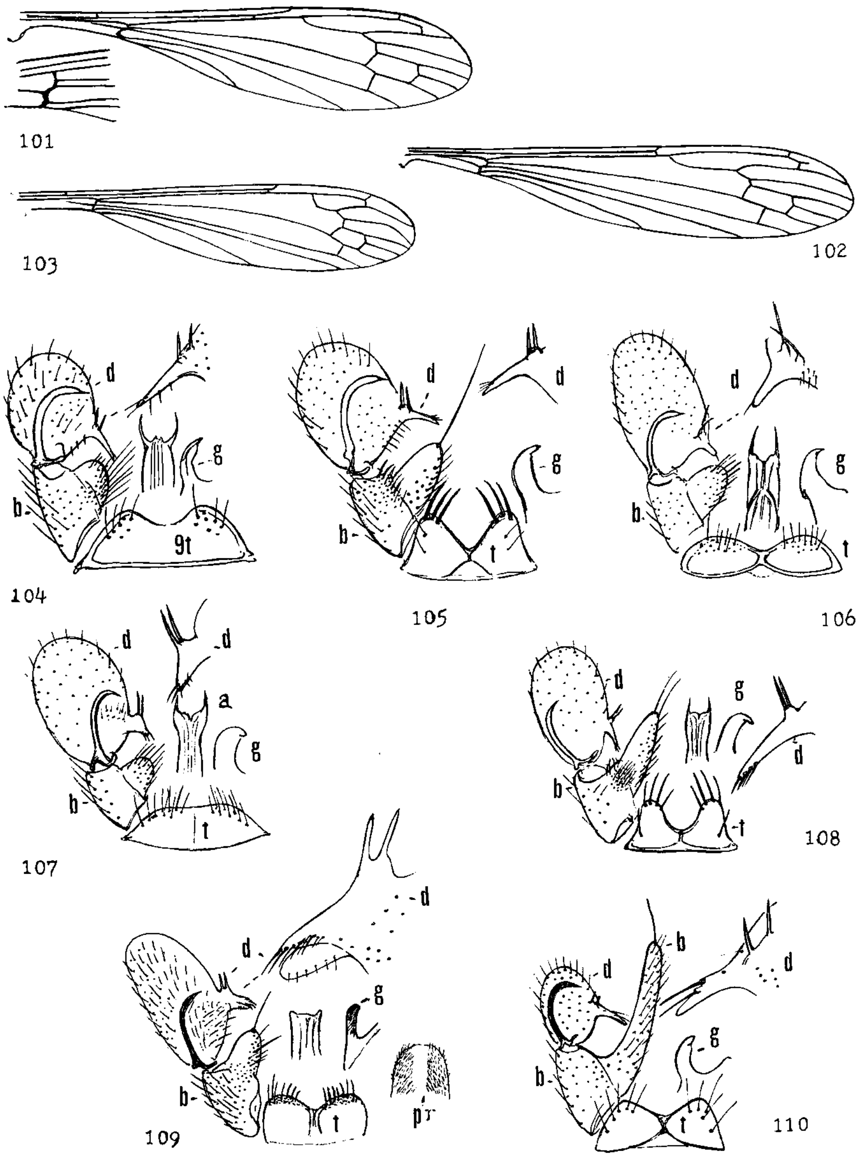

FIGURE 101–110. Genus *Limonia* Meigen, Subgenus *Thrypticomyia* Skuse. **101.** *Limonia* (*Thrypticomyia*) *decussata* Alexander, n. sp.; venation **102.** *Limonia* (*Thrypticomyia*) *arachnophila* Alexander; venation **103.** *Limonia* (*Thrypticomyia*) *ponapicola* Alexander, n. sp.; venation **104.** *Limonia* (*Thrypticomyia*) *arachnophila* Alexander; male hypopygium **105.** *Limonia* (*Thrypticomyia*) *carolinensis* Alexander; male hypopygium **106.** *Limonia* (*Thrypticomyia*) *decussata* Alexander, n. sp.; male hypopygium **107.** *Limonia* (*Thrypticomyia*) *ponapicola* Alexander, n. sp.; male hypopygium **108.** *Limonia* (*Thrypticomyia*) *tetrachaeta* Alexander, n. sp.; male hypopygium **109.** *Limonia* (*Thrypticomyia*) *tinianensis* Alexander, n. sp.; male hypopygium **110.** *Limonia* (*Thrypticomyia*) *unisetosa perelongata* Alexander, n. subsp.; male hypopygium (Symbols: *a*, aedeagus; *b*, basistyle; *d*, dististyles; *g*, gonapophysis; *t*, ninth tergite).

Hugh Scott. (Edwards, 1912, Trans. Linn. Soc. London, 2nd series, Zool., **15:** 199–200)

44. Limonia (Thrypticomyia) arachnophila (Alexander) (figs. 31, 102, 104)

Dicranomyia (Thrypticomyia) arachnophila Alexander, 1927, Philip. J. Sci., **33:** 301–302, fig. 7 (male hypopygium), fig. 10 (venation).

Limonia (Thrypticomyia) arachnophila: Alexander, 1940, Annot. Zool. Japon., **19:** 212.

Type from Luzon, Philippines.

MALE: Length about 4–5 mm.; wing 5–7 mm.

FEMALE: Length about 4–4.5 mm.; wing 5–6 mm.

General coloration dark brown; thorax with lateral praescutal borders paler, pleura obcure yellow, slightly patterned with brown, especially on sternopleurite. Legs brownish black to black, tarsi extensively snowy white, the amount variable, in cases including the entire basitarsus, in other cases the proximal ends of latter brown, in extreme cases including more than one-half the segment, outer three segments more yellowish white. Wings (figs. 31, 102) subhyaline, stigma brown, in cases more enlarged; veins dark brown. Venation: Sc_1 ending shortly before origin of *Rs*, very variable in length, in cases subequal to Sc_2, in others, including the type, twice this length, in the extreme cases much longer to fully one-half *Rs;* free tip of Sc_2 likewise variable, from about one-third vein R_1 beyond it, as shown, to more than one-half this vein; R_{1+2} a long spur that commonly exceeds R_2 in length; cell *1st* M_2 slightly longer than vein M_4; *m-cu* at midlength to about three-fifths M_{3+4}.

Male hypopygium (fig. 104) with ninth tergite, *t*, transverse, narrowed posteriorly, outer border broadly emarginate, lobes low and obtuse, each with about eight long setae, none modified or marginal in position. Basistyle, *b*, with ventromesal lobe short and obtuse, stout, setae long, lacking on caudal parts. Dorsal dististyle, *d*, a stout curved sickle, produced apically into a long spine; ventral spine fleshy, in area about one-fourth larger than the basistyle; rostral prolongation slender, narrowed to the subacute tip, apical setae relatively small and weak; rostral spines at base of prolongation, short, separated by a distance about equal to one-half their length. Aedeagus with spines of apical lobes long and slender.

DISTRIBUTION: Philippine Is. eastward to New Guinea, New Hebrides, Caroline and Solomon Is.

PALAU. AULUPTAGEL: (Aurapushekaru) I., Sep. 1952, Krauss (BISHOP). BABELTHAUP I., Airai, May 16, 1957, Sabrosky (US); Melekeiok, May 24, 1957, Sabrosky, Ngaremeskang, alt. 25 meters, Dec. 20, 1952, Gressitt (BISHOP); Ngerehelong, May 6, 1957, Sabrosky (US). KOROR: Koror, male and female, on spider web, Aug. 12, 1953, Beardsley (BISHOP); 25 meters, Dec. 5, 1952, light trap, Gressitt; same, male and female, April 17—May 2, 1957, Sabrosky, "swinging on spider web between two plants", (US); Ngarbaged (Arubaketsu as Arabaketsu), Feb. 1, 1938, Esaki (KU). PELELIU: east coast, Aug. 1–2, 1945, male and female, Dybas & R. B. Page (CM); Amiangal Mt., Dec. 23, 1952, Gressitt (BISHOP). FAIS: October 5, 1952, Krauss (BISHOP). YAP. GAGIL: Gachapar, June 19, 1957, Sabrosky (US); Gili-

man, June 10–12, 1957, on spider web, Sabrosky (US). Mt. Matade, 95 meters, Dec. 1, 1953, Gressitt (BISHOP). Weloy, Dugor, June 15, 1957, Sabrosky. YAP: hill behind Yaptown, 50 meters, male and female, light trap, Nov. 29—Dec. 2, 1952, Gressitt (BISHOP). KAPINGAMARANGI. RINGUTORU: among *Nephrolepis* and grasses, Aug. 25, 1954, W. A. Niering (BISHOP). WERUA: Aug. 2, 1954, Niering (BISHOP). ULITHI. FASSAROL: Oct. 7, 1952, Krauss (BISHOP). MOGMOG: Oct. 6, 1952, Krauss.

45. Limonia (Thrypticomyia) carolinensis Alexander (fig. 105)

Limonia (*Thrypticomyia*) *microstigma carolinensis* Alexander, 1940, Annot. Zool. Japon., **19:** 213.

MALE: Length about 5–5.5 mm.; wing 5–5.5 mm.

FEMALE: Length about 4.5–5 mm.; wing 4.8–5.5 mm.

General coloration and appearance as in *microstigma* Alexander (North Queensland, Cairns District).

General coloration dark brown; head with vertex clear silvery gray. Mesonotum brown, pleura obscure brownish-yellow. Halteres brown. Legs brown, tarsi white, proximal one-half to two-fifths of basitarsi darkened. Wings nearly hyaline, apex faintly clouded, stigma brown, small, virtually restricted to costal cell cephalad of vein *R*. Venation: Sc_1 ending opposite or immediately before origin of *Rs; m-cu* at near midlength of M_{3+4}, *Rs* longer than R_{2+3}.

Abdominal tergites dark brown, sternites paler. Male hypopygium (fig. 105) with the ninth tergite, *t*, nearly parallel-sided, posterior border deeply emarginate, lobes relatively narrow, each with three powerful nearly marginal setae, with two normal setae on sides nearer base. Basistyle, *b*, with ventromesal lobe larger, at least one-half the size of body of style, pale, with long normal setae on cephalic half, apex with a single very long bristle that is fully as long as the lobe. Dorsal dististyle, *d*, a gently curved rod; ventral style relatively large, its area about one-half greater than that of the basistyle, prolongation slender, pointed at apex, with strong setae near tip; rostral spines at base of prolongation, arising from a low common tubercle, separated from one another by a distance about equal to the diameter of either spine.

DISTRIBUTION: Caroline Is. (Palau, Kusaie).

PALAU. AULUPTAGAL (Aurapushekaru): Sept. 1952, Krauss (US). KUSAIE: Lelo, Dec. 4, 1937, Esaki, on spider webs (KU; type).

46. Limonia (Thrypticomyia) decussata Alexander, n. sp. (figs. 101, 106)

Mesonotal praescutum brownish yellow with three confluent dark brown stripes, pleura yellow; legs black, including more than proximal half of basitarsi, outer segments white; wings weakly suffused, stigma small, Sc_1 ending opposite origin of *Rs, m-cu* from one-third to nearly one-half its own length beyond fork of *M;* male hypopygium with ninth tergite very broad, constricted midwidth, lobes with numerous setae, ventromesal lobe of basistyle short, obtuse, with numerous setae; spines of ventral dististyle elongate, decussate.

MALE: Length about 5–5.5 mm.; wing 5.5–6.5 mm.

FEMALE: Length about 5–6 mm.; wing 6–6.5 mm.

Rostrum yellowish brown, palpi black. Antennae relatively long, black; flagellar segments elongate, with conspicuous apical pedicels, shorter than the unilaterally distributed major setae, terminal segment longer than the penultimate, outer half narrowed. Head medium brown in front, dark brown behind; anterior vertex about as broad as the diameter of scape.

Pronotum brownish yellow. Mesonotal praescutum brownish yellow, with three confluent

dark brown stripes, interspaces barely evident, scutal lobes similarly dark brown; posterior sclerites of notum more yellowed. Pleura yellow, ventral sternopleurite weakly infuscated. Halteres with stem obscure yellow, knob brownish black. Legs with coxae yellow, fore pair a little darker, trochanters yellow; femora, tibiae and about the proximal half of basitarsi brownish black, remainder of tarsi snowy white. Wings (fig. 101) weakly suffused, stigma relatively small, darker brown; veins dark brown. Longitudinal veins beyond cord with long trichia, more basally including *Rs*, distal fifth of *M*, with one or two at ends of basal section of Cu_1 and *1st A*. Venation: Sc_1 ending opposite origin of *Rs*, Sc_2 retracted, Sc_1 in cases to more than three-fourths *Rs*; R_1 between free tip of Sc_2 and R_2 more than twice the latter; outer spur of R_{1+2} lacking or present, in extreme cases nearly equal to R_2; cell *1st* M_2 subequal to distal section of M_3; *m-cu* from about one-third to nearly its own length beyond fork of *M*.

Abdominal tergites and hypopygium brownish black to black, central parts of sternites more yellowed. Male hypopygium (fig. 106) with ninth tergite, *t*, unusually narrow, especially the central chitinized structure, lobes low, each with more than a dozen long setae. Lobe of basistyle, *b*, relatively short, obtuse, with long setae, none modified. Dorsal dististyle, *d*, suddenly narrowed at apex; ventral style in area about twice the basistyle; rostral prolongation abruptly narrowed, spines on face of style before base of rostrum, unusually long, from small basal tubercles, upper spine straight, lower one more curved, lying across the former, presenting a decussate effect. Gonapophysis, *g*, with mesal-apical lobe relatively slender, tip acute. Apical spines of aedeagus long, acute.

DISTRIBUTION: Caroline Is. (Pingelap).

Holotype, male (BISHOP 9784), Pingelap A., eastern Carolines, Jan. 26, 1953, Gressitt (BISHOP). Allotopotype, female (BISHOP). Paratopotypes, 3 males and females, in part fragmentary.

Limonia (*Thrypticomyia*) *decussata* is most similar to *L.* (*T.*) *subsaltens* Alexander, of Fiji and New Caledonia, differing especially in hypopygial structure, including the ninth tergite which is conspicuously more constricted medially.

47. Limonia (Thrypticomyia) ponapicola Alexander, n. sp. (figs. 103, 107)

Size large (wing of male about 7.5 mm.); general coloration of mesonotal praescutum cinnamon brown; legs with basitarsi extensively black, outer one-fourth to one-fifth and remainder of tarsi snowy white; wings nearly hyaline, apex weakly darkened, vein *Sc* short, Sc_1 ending a distance before origin of *Rs* nearly equal to the length of the latter, *Rs* angulated, free tip of Sc_2 far distad, in transverse alignment with R_2; *m-cu* at near midlength of M_{3+4}, vein *2nd A* long; male hypopygium with posterior border of ninth tergite virtually truncate, without modified setae, basistyle stout, ventral dististyle very large, its rostral prolongation short and stout.

MALE: Length about 7 mm.; wing 7.5 mm.

The type material apparently was dried following immersion in alcohol. Rostrum obscure yellow, palpi dark brown. Antennae with scape and pedicel brown, flagellum black; flagellar segments long-oval, with conspicuous apical pedicels; longest verticils unilaterally distributed, about one-half longer than the segment. Head dark brown.

Mesonotal praescutum and scutal lobes almost uniformly cinnamon brown, posterior sclerites of notum and the pleura testaceous yellow. Halteres elongate, brown, knob darker. Legs with coxae and trochanters testaceous yellow; remainder of legs brown, including the proximal three-fourths to four-fifths of the basitarsi, remainder of tarsi snowy white; claws

with a single long slender basal spine, the basal denticles inconspicuous. Wings (fig. 103) nearly hyaline, outer end weakly darkened, not reaching outer end of cell *1st* M_2; stigma long-oval, dark brown; veins dark brown. Macrotrichia of veins long and conspicuous, on most longitudinal veins of outer half, extensively so on both Anals, particularly *2nd A*. Venation: *Sc* short, distance on costa between tip of Sc_1 and origin of *Rs* nearly the length of the latter which is very short, angulated and weakly spurred before midlength; Sc_2 a short distance from tip of Sc_1; free tip of Sc_2 far distad, in transverse alignment with R_2; outer end of R_{4+5} deflected caudad, ending at wing tip; cell 1*st* M_2 subrectangular, slightly widened outwardly; *m-cu* at near midlength of M_{3+4}; vein 2*nd A* long, ending shortly before level of tip of Sc_1.

Abdominal tergites, with the hypopygium, dark brown, sternites more yellowed. Male hypopygium (fig. 107) with ninth tergite, *t*, transverse, posterior border virtually truncate, on either side with about nine long setae, lacking in mid area. Basistyle, *b*, with ventromesal lobe short, the length about one-half greater than the basal diameter, with long unmodified setae. Dorsal dististyle, *d*, a slender gently curved rod, the long tip acute; ventral style very large, its area more than three times that of basistyle; rostral prolongation unusually short and stout, especially the outer portion beyond the spines which is only about as long as a single spine, the latter placed close together at near one-third the length of the prolongation. Gonapophysis, *g*, relatively broad. Aedeagus, *a*, with long apical spines.

DISTRIBUTION: Caroline Is. (Ponape).

Holotype, a broken male (US 72343), Nanpil, Nett District, Ponape I., Feb. 27, 1948, Dybas.

Limonia (*Thrypticomyia*) *ponapicola* is quite distinct from all other species in the venation, particularly the short *Rs* and the distal position of the free tip of Sc_2 and in hypopygial structure, especially the rostral prolongation of the ventral style and its spines. The most similar species is *L.* (*T.*) *marksae* Alexander, of North Queensland.

48. Limonia (Thrypticomyia) tetrachaeta Alexander, n. sp. (fig. 108)

Size medium (wing of male about 5.5 mm. or less); general coloration of mesonotum light cinnamon brown, pleura more yellowed; flagellar segments strongly pedicellate; legs black basally, including about the proximal third of basitarsi, remainder snowy white; wings hyaline, stigma small, dark brown; *Sc* unusually short, Sc_1 ending a distance before origin of *Rs* equal to nearly one-half the latter; *m-cu* just before midlength of M_{3+4}; male hypopygium with ninth tergite deeply emarginate, each lobe with four strong modified setae; basistyle with ventromesal lobe conspicuous, its length about three times the basal diameter, at apex with two elongate modified setae; ventral dististyle with rostral prolongation slender, spines two, both at summit of a single strong basal tubercle.

MALE: Length about 5.3–5.5 mm.; wing 5.2–5.5 mm.

FEMALE: Length about 4.2 mm.; wing 5 mm.

Rostrum testaceous yellow, palpi with basal segment obscure yellow, remainder black. Antennae with scape and pedicel brown, remainder black; flagellar segments very strongly pedicellate, cylindrical, the abrupt apical necks nearly one-third the body of segment; longest verticils unilaterally arranged, about twice the segments, remainder of segment with short dense black setulae. Head dark brown behind, more yellowed beneath, the broad anterior vertex gray.

Pronotum testaceous yellow. Mesonotum almost uniformly light cinnamon brown, central region of praescutum slightly darker, pleura more yellowed. Halteres black. Legs with coxae

and trochanters yellow; femora black, bases restrictedly pale; tibiae and about the proximal third of basitarsus black, remainder of tarsi snowy white. Wings hyaline, stigma small, dark brown; veins black. Venation: *Sc* unusually short, Sc_1 ending a distance before origin of *Rs* nearly equal to one-half the latter, Sc_2 not far from tip; cell 1*st* M_2 long, subequal to distal section of M_{1+2}; *m-cu* shortly beyond midlength of M_{3+4}.

Abdomen, including hypopygium, dark brown, basal sternites paler. Male hypopygium (fig. 108) with posterior border of ninth tergite, *t*, broadly emarginate, the notch wider than the lobes, apex of each lobe darkened, with four separated strong setae, the outer one a trifle smaller, near base of tergite on either side with a single long but weaker bristle. Basistyle, *b*, with ventromesal lobe long but not as excessive as in *unisetosa* and allies, the length about three times the basal diameter, apex with two modified setae that are longer and somewhat stouter than the other setae, their length exceeding half the length of the lobe; face of basistyle near base of lobe with a concentration of about 30 long delicate setae. Dorsal dististyle, *d*, slender, ventral style large and fleshy, its area greater than that of the basistyle; rostral prolongation slender, at and back from apex with about four strong yellow bristles that are directed outwardly; rostral spines two, both placed at summit of a strong basal tubercle, the latter about one-half the length of the spine. Proctiger elongate-shield-shaped, nearly as long as the aedeagus, with abundant setulae, as in the subgenus. Gonapophysis, *g*, with mesal-apical lobe a relatively broad blade, tip narrowed into a point. Terminal spines of aedeagus long, at bases not as strongly divergent as in *arachnophila* and some others.

DISTRIBUTION: Caroline Is. (Palau).

Holotype, male (US 72344) Babelthuap I., East Ngatpang, altitude 65 meters, Dec. 9, 1952, Gressitt. Allotype, female (BISHOP 9785), Auluptagel (Aurapushekaru) I., Sept. 1952, Krauss. Paratype, one male, with the allotype (ALEX).

In hypopygial structure *Limonia* (*Thrypticomyia*) *tetrachaeta* is most similar to *L.* (*T.*) *microstigma* Alexander and *L.* (*T.*) *carolinensis* Alexander, especially in the deeply emarginate ninth tergite with relatively few setae. It is most readily told by the number of modified tergal setae, unusually long ventromesal lobe of the basistyle, with two modified setae, and in having both rostral spines placed at the summit of a common basal tubercle.

49. **Limonia (Thrypticomyia) tinianensis** Alexander, n. sp. (fig. 109)

Size medium (wing of male 6 mm.); general coloration of mesonotal praescutum fulvous; legs with outer two-fifths of basitarsi whitened; inner end of cell 1*st* M_2 of wings produced basad of other elements of cord; male hypopygium with ninth tergite broadly emarginate, each lobe more thickened apically, with six or seven unusually strong black setae; basistyle with ventromesal lobe relatively short and stout, apical modified seta approximately two-thirds the lobe, from a small basal tubercle; ventral dististyle large, rostral prolongation divided at apex, the upper lobule with strong setae.

MALE: Length about 6 mm.; wing 6 mm.

FEMALE: Length about 5.3–5.5 mm.; wing 5.4–5.5 mm.

Rostrum light yellow, palpi with basal segment yellow, remainder black. Antennae black, relatively long; flagellar segments shorter than their longest verticil; terminal segment from about one-third to one-half longer than the penultimate. Head brown.

Pronotum light brown. Mesonotum chiefly fulvous, prescutum and scutal lobes more medium brown; pleura more yellowed, especially behind. Halteres long and slender, stem

brown, yellowed at base, knob brownish black. Legs with coxae and trochanters yellow, fore coxae slightly darker; femora, tibiae and proximal three-fifths of basitarsi dark brown, remainder of tarsi snowy white. Wings whitish subhyaline, outer cells vaguely more darkened; stigma darkened, long and narrow, relatively small; veins dark brown. Venation: *Sc* short, Sc_1 ending a distance before origin of *Rs* about equal to *m-cu*, Sc_2 not far removed from tip; vein R_{1+2} longer than R_2; inner end of cell *1st* M_2 produced basad of other elements of cord; *m-cu* at near two-thirds M_{3+4}.

Abdomen, including hypopygium, brown to dark brown. Male hypopygium (fig. 109) with ninth tergite, *t*, broadly emarginate posteriorly, apex of lobes thickened and with six or seven unusually strong black setae, these lacking on the unthickened parts. Basistyle, *b*, with ventromesal lobe relatively short and stout, the lower or inner surface with strong setae, the apical one approximately two-thirds the length of the lobe, from a small basal tubercle. Dorsal dististyle, *d*, pale yellow, outer half gently curved; ventral style fleshy, its area about twice that of the basistyle, the setae scattered; rostral prolongation with the apex divided, the broad lower blade with about six small submarginal setae, upper lobe more slender, with a row of stronger setae, especially the outer ones; rostral spines at summit of a low transverse tubercle, shorter than the rostrum beyond their bases.

DISTRIBUTION: Mariana Is. (Tinian).

Holotype, male, FM (CM) Marpo Valley, Tinian I., Oct. 8, 1945, Dybas. Allotopotype, female (FM), with type. Paratopotypes (BISHOP, US, FM, ALEX), seven males and females, with types.

Limonia (*Thrypticomyia*) *tinianensis* is closest to *L.* (*T.*) *carolinensis* Alexander, differing in slight venational details, including the long vein *Sc* and elongate R_{2+3} that exceeds one-half the length of *Rs*, and in hypopygial characters, including the vestiture of the ninth tergite and the stout slightly divided rostral prolongation of the present fly.

50. Limonia (Thrypticomyia) unisetosa perelongata Alexander, n. subsp. (fig. 110)

Thrypticomyia arcuata Alexander, 1920, Trans. Amer. Ent. Soc., **46:** 4.

Limonia (*Thrypticomyia*) *unisetosa* Alexander (re-naming of *arcuata* Alexander, preoccupied), 1929, Philip. J. Sci., **40:** 248.

The type material of typical *unisetosa* was from Tokyo, Japan, the race being widely distributed in eastern Asia, from Honshu to Taiwan (Formosa) and in southeastern China.

MALE: Length about 5.5 mm.; wing 6 mm.

Rostrum and palpi dark brown. Antennae brown; flagellar segments with conspicuous apical necks; segments with abundant short white setulae and sparse long verticils. Head dark brown, front more pruinose; anterior vertex broad, more than three times the diameter of scape.

Thoracic dorsum brownish fulvous, pleura yellow. Halteres with stem light brown, knob darker brown. Legs with coxae and trochanters yellow; femora and tibiae dark brown to brownish black, basitarsi broadly blackened basally, including one-half or more of segment, remaining segments white, terminal one slightly more darkened. Wings subhyaline, stigma brown; veins dark brown. Venation: Sc_1 ending opposite origin of *Rs*, Sc_2 retracted, Sc_1 longer than *m-cu*; inner end of cell *1st* M_2 arcuated, *m-cu* at near two-thirds M_{3+4}.

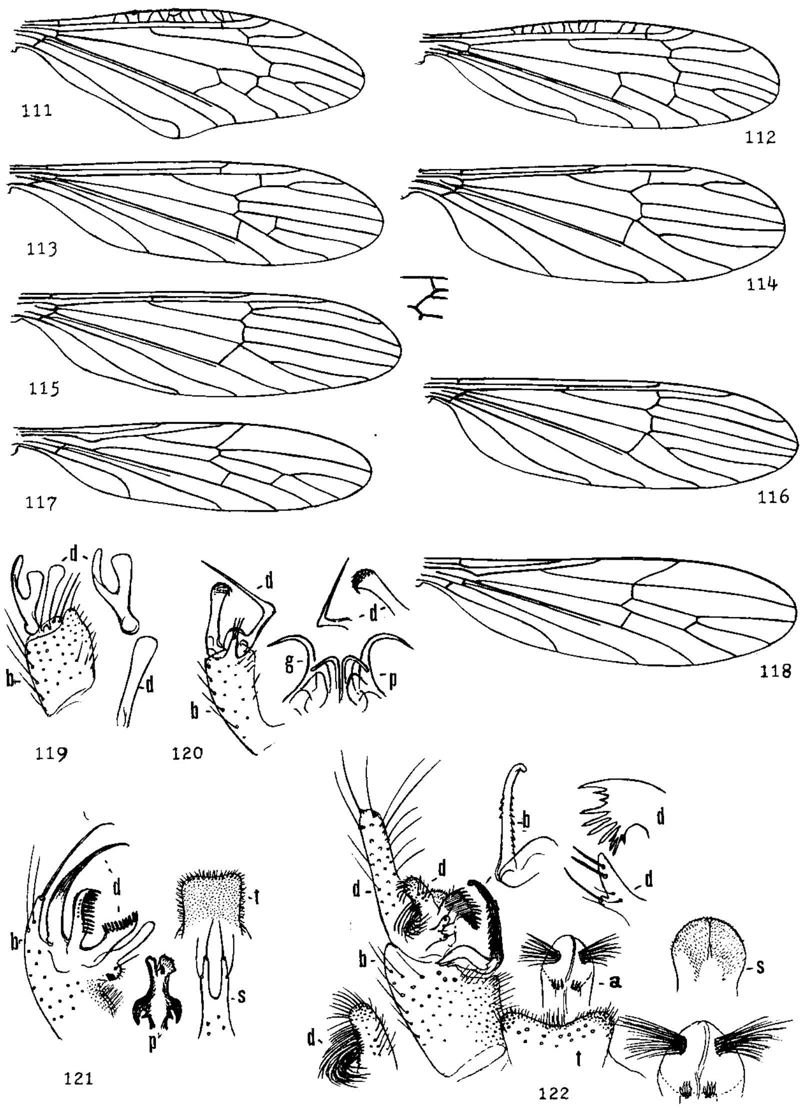

FIGURE 111–122. Genera *Conosia* van der Wulp, *Cheilotrichia* Rossi, *Erioptera* Meigen, and *Styringomyia* Loew. **111.** *Conosia irrorata* (Wiedemann); venation, male **112.** *Conosia insularis* Alexander; venation, male **113.** *Cheilotrichia* (*Cheilotrichia*) *palauensis* Alexander, n. sp.; venation **114.** *Cheilotrichia* (*Empeda*) *clarkeana* Alexander, n. sp.; venation **115.** *Erioptera* (*Meterioptera*) *angustifascia* Alexander; venation **116.** *Erioptera* (*Meterioptera*) *geniculata* Edwards; venation **117.** *Styringomyia didyma* Grimshaw; venation **118.** *Styringomyia sabroskyi* Alexander, n. sp.; venation **119.** *Cheilotrichia* (*Empeda*) *clarkeana* Alexander, n. sp.; male hypopygium **120.** *Erioptera* (*Meterioptera*) *geniculata* Edwards; male hypopygium **121.** *Styringomyia didyma* Grimshaw; male hypopygium **122.** *Styringomyia sabroskyi* Alexander, n. sp.; male hypopygium (Symbols: *a*, aedeagus; *b*, basistyle; *d*, dististyles; *g*, gonapophysis; *p*, phallosome; *s*, sternite; *t*, tergite).

Abdomen, including hypopygium, dark brown, basal sternites paler. Male hypopygium (fig. 110) as in typical *unisetosa*, differing in slight details. Ninth tergite, *t*, with posterior border broadly emarginate, median area very narrow; lobes with four or five unusually long slender setae, none marginal. Basistyle, *b*, with ventromesal lobe of unusual length and slenderness, at least five times as long as broad, terminal modified seta only moderately lengthened, about twice as long as the normal setae. Ventral dististyle, *d*, with rostral prolongation about as in the typical race, the usual two spines on body of style at base of prolongation; two strong setae on outer margin of prolongation beyond the spines.

DISTRIBUTION: Bonin Islands.

Holotype, male (US 72345), Haha Jima, Okimura, April 26—June 9, 1958, Snyder.

In the extensively blackened basitarsi the present fly agrees with *Limonia* (*Thrypticomyia*) *unisetosa nigribasis* Alexander, 1957, of Nepal, differing most evidently in details of hypopygial structure, including the unusually long ventromesal lobe of the basistyle.

Genus **Orimarga** Osten Sacken

Orimarga Osten Sacken, 1869, Mon. Diptera North America, Part **IV:** 120. Smithsonian Misc. Coll., 8. (type: *Limnobia alpina* Zetterstedt)

Ninguis Wallengren, 1881, Ent. Tijdschr., **2:** 183 (type: *Limnobia alpina* Zetterstedt)

Orimarga is a relatively small genus, in the typical subgenus including approximately 40 species in the Oriental region and about 12 in Australasia, including New Guinea, New Caledonia, and Fiji. Two species are known from Micronesia.

The immature stages of the subgenus *Orimarga* as presently known are hygropetric (see Vaillant, F., 1950, Travaux du Laboratoire d'Hydrobiologie et Pisciculture de Grenoble, 1949–1950: 43–47), the species discussed being *Orimarga* (*Orimarga*) *hygropetrica* Vaillant, in France.

Key to Micronesian Species of Orimarga

1. Wings (fig. 94) tinged with grayish yellow, prearcular and costal fields clearer yellow; vein R_{1+2} atrophied or represented by a spur that is shorter than vein R_2...**51. palauiana**

   Wings (fig. 95) slightly infuscated, the costal region slightly darker; vein R_{1+2} elongate, from two to three times vein R_2 or more..................................**52. perextensa**

51. **Orimarga** (**Orimarga**) **palauiana** Alexander (fig. 94)

Orimarga (*Orimarga*) *palauiana* Alexander, 1940, Annot. Zool. Japon., **19:** 213–214, fig. (venation).

MALE and FEMALE: Length about 5–5.5 mm.; wing about 4.5–5 mm.

General coloration of mesonotum dark brown, polished, thoracic pleura yellow with a large brown area on mesepisternum. Antennae black. Legs brown. Wings (fig. 94) narrow, faintly tinged with grayish yellow, prearcular and costal fields more yellowed. Venation:

Rs slightly angulated at origin, R_2 long, perpendicular, slightly longer than outer section of R_1, R_{1+2} jutting beyond level of R_2 as a very short to scarcely indicated spur, in cases to one-half the length of vein R_2; *m-cu* nearly opposite one-third the length of *Rs* or about five times its length before the fork of *M*. Abdomen obscure yellow. Male hypopygium differing from that of *perextensa*, especially in the phallosome. Basistyle with the outer lobe or cushion larger and more conspicuous in the present fly, but the setal vestiture is shorter and stouter.

DISTRIBUTION: E. Caroline Is. (Palau).

PALAU. KOROR (Korror): Ngarbaged (equals Arabaketsu), Feb. 1, 1938, Esaki (KU; type, female); July 20, 1953, at light, Beardsley (US). BABELTHAUP: alt. 1 meter, Dec. 16, 1952, light trap, Gressitt (BISHOP); one female, Ngaremlengui, June 3, 1957, Sabrosky (US).

52. **Orimarga (Orimarga) perextensa** Alexander, n. sp. (figs. 95, 100)

Size small (wing of male about 4.5 mm., of female about 5 mm.); mesonotal praescutum and scutal lobes polished brownish black, pleura and pleurotergite yellowed; halteres and legs darkened; wings weakly infuscated, costal border and apex narrowly more darkened, R_{1+2} long, nearly equal to R_{2+3}; male hypopygium large, mesal face of basistyle at proximal end with tufts of long yellow setae; dististyles united basally; gonapophyses conspicuous, appearing as subtriangular darkened plates, the outer angle extended into a fingerlike rod.

MALE: Length about 5–5.2 mm.; wing 4.4–4.7 mm.

FEMALE: Length about 6.5 mm.; wing 5 mm.

Rostrum brownish black, sparsely pruinose; palpi black. Antennae black; flagellar segments long-oval, with dense black setae, verticils longer than the segments. Head large, dull black, with conspicuous setae.

Pronotum dark brown above, sides yellowed. Mesonotal praescutum of male polished brownish black, lateral borders restrictedly yellowed, in female these margins broader; scutal lobes similarly brownish black, median area, scutellum and mediotergite dark brown. Pleura, including pleurotergite and lateral borders of mediotergite yellow, sides of sternopleurite slightly infuscated and pruinose. Halteres blackened. Legs with coxae yellowed, fore pair slightly darker, trochanters clearer yellow; remainder of legs dark brown, outer tarsal segments blackened. Wings (fig. 95) weakly darkened, cells *C* and *Sc* narrowly more infuscated, this pattern narrowly extended along border to wing tip; veins dark brown. Macrotrichia on longitudinal veins beyond general level of fork of *Rs*, including outer ends of Cu_1 and *1st A*; *Rs*, *M* and remainder of Anals glabrous. Venation: Sc_1 ending shortly beyond fork of *Rs*, Sc_2 near its tip; free tip of Sc_2 faintly indicated, about twice its length before R_2; R_{1+2} long to very long, in cases nearly as long as either *Rs* or R_{2+3}, in other cases shorter, from about one and one-half to two times R_2; cell M_3 subequal to its petiole; *m-cu* about opposite midlength of *Rs*.

Abdominal tergites of male brownish black, the outer ones paler with the posterior borders more darkened; sternites more evidently dimidiate, yellowed basally, apices brownish black, hypopygium blackened. In female, segments brownish yellow, apices narrowly brownish black. Ovipositor with cerci slender, strongly upcurved to the acute tips. Male hypopygium (fig. 100) unusually large. Basistyle, *b*, relatively long, proximal end of mesal face with three slightly separated groups or tufts of very long yellow setae, those of outer group stouter; mesal face of style with a concentration of relatively small delicate setae. Dististyles, *d*, united on about their basal third, outer style a slender blackened glabrous rod, gently curved to the acute tip, inner style slightly longer and paler, its tip slightly expanded, with a concentration of

short pale suberect setae, basal half of style with few longer erect setae. Gonapophysis, *g*, conspicuous, each appearing as a subtriangular darkened plate, outer angle extended into a fingerlike rod, its tip obtuse.

DISTRIBUTION: W. Caroline Is. (Palau).

Holotype, male (US 72346); Palau, Babelthuap I., Ngaremlengui, June 2, 1957, Sabrosky. Allotype, female (BISHOP 9786), Babelthuap, Ngatpang, alt. 65 meters, Dec. 6 1952, Gressitt. Paratopotype, one male, with type; paratype, one male, with allotype.

Orimarga (*Orimarga*) *perextensa* is most readily told from *O.* (*O.*) *palauensis* Alexander and other regional species by the venation of the radial field, especially the elongate vein R_{1+2}. This condition represents the extreme as known in Old World species but is equalled or exceeded by several Neotropical members of the genus.

Tribe ERIOPTERINI

In virtually all faunal regions the tribe Eriopterini is represented by a host of species arranged in relatively few genera. In the recently issued catalogues of the Neotropical and Oriental Tipulidae by Charles P. Alexander and Mabel M. Alexander, the former (1970) includes 1045 species in 27 genera, while the latter (1972) has 838 species in 25 genera. In comparison, the Micronesian list as presently known, has only 17 species that are placed in 6 genera. The two largest of these are *Gonomyia* with 6 species (Neotropical 216, Oriental 210) and *Trentepohlia* with 5 species (Neotropical 42, Oriental 108).

The six regional genera are unusually distinct and are readily separated. Some further observations on their relationships and biological notes are provided under the different groups.

Key to Micronesian Genera of Eriopterini

1. Wings (figs. 111, 112) with cell M_1 present, vein *Sc* very long, Sc_1 ending close to tip of vein R_{1+2} or beyond the general level of *r-m;* maxillary palpi long-clavate, 1-segmented .... **Conosia**
   Wings (figs. 113–118, 123–129) with cell M_1 lacking, vein *Sc* shorter (except in *Trentepohlia*); maxillary palpi with more than a single segment 2
2. Wings with vein R_5 fused extensively with vein M_{1+2} to form the anterior border of cell M_2 or *1st* M_2, *r-m* thus being obliterated; in regional species veins Cu_1 and *1st A* fused at margin, closing cell *Cu* (figs. 126–129) .... **Trentepohlia**
   Wings with veins R_5 and M_{1+2} not fused as above, *r-m* preserved; cell *Cu* widely open at wing margin 3
3. Wings (figs. 117, 118) with vein R_1 ending at or near midlength; anterior branch of *Rs* short, oblique to nearly erect, ending before three-fourths the wing length... .... **Styringomyia**

Wings (figs. 113–116, 123–125) with vein R_1 ending at or beyond two-thirds the length, anterior branch of *Rs* elongate, not suberect, at origin extending generally parallel to the posterior branch, ending beyond four-fifths the wing length............4

4. Wings (figs. 123–125) with vein R_2 lacking, cell R_3 present or absent............**Gonomyia**

Wings (figs. 113–116) with vein R_2 present..5

5. Wings (figs. 115, 116) with cell R_3 deep, much longer than its petiole (R_{2+3+4}), with vein R_2 beyond the fork leaving an element R_{2+3}................................**Erioptera**

Wings (figs. 113, 114) with cell R_3 more shallow, vein R_2 before the fork, leaving a short to longer element R_{3+4} ....(**Cheilotrichia**) 6

6. Wings (fig. 113) with cell *1st* M_2 closed; (regional species with wings pale yellow, including the veins)...**Cheilotrichia** (**Cheilotrichia**)

Wings (fig. 114) with cell M_2 open by atrophy of *m;* (regional species with veins brown, distinct, including R_2).....................................**Cheilotrichia** (**Empeda**)

Genus **Conosia** van der Wulp

Conosia van der Wulp, 1880, Tijdschr. Ent., **23:** 159 (type: *Limnobia irrorata* Wiedemann)

The genus *Conosia* includes a common widespread species in the Old World, *irrorata* (Wiedemann), together with fewer less common forms as discussed below. The type species occurs over much of Africa and southern Asia, eastward into Australia. In Asia it is found as far west as Israel and in the east northward into Korea and northern Japan. There are various generally similar forms that are difficult to define, including the species here considered. Several of these occur in Africa and outlying islands in the Indian ocean. In India and Ceylon a very small representative, *Conosia minuscula* Alexander, is found. The regional species, *Conosia insularis,* is best distinguished from *irrorata* by the wing shape and further minor characters.

The genus customarily has been placed in the Eriopterini but, as has been discussed in other papers, it probably will be found to be more correctly assigned to the tribe Hexatomini.

Rostrum very reduced; maxillary palpi with a single clavate segment that is shorter than the antennal scape. Antennae 12-segmented, flagellum with ten segments, including a stout basal fusion element comprised of five segments, with nine outer separate segments, cylindrical, progressively lengthened outwardly, with long conspicuous verticils at or shortly beyond midlength, terminal segment longer than the penultimate. Anterior vertex broad, on ventral surface eyes narrowly separated or in punctiform contact with one another.

Pronotum small, concealed from above by the anteriorly produced mesonotal praescutum; no tuberculate pits; pseudosutural foveae very reduced to scarcely apparent. Legs without tibial spurs; claws long and slender, smooth. Wings (figs. 111, 112) with several crossveins in costal cell, oblique to virtually transverse, more evident in the male. Venation: Vein *Sc* very long, ending beyond R_2 and nearly attaining tip of R_{1+2}*;* *Rs* long, in longitudinal alignment with R_4, R_{2+3} and R_5 arising close together at end of *Rs*, the former erect, R_2 directed slightly basad, oblique; *r-m* beyond outer end of cell 1*st* M_2*;* *M* with four branches; *m-cu* beyond fork of *M* on vein M_{3+4}. Male hypopygium with ninth tergite transverse, posterior border slightly convex. Two slightly subterminal dististyles, the outer one more slender, gently curved out-

wardly into a spine, outer surface before apex with inconspicuous pale spinules; inner style stout, near outer end narrowed and strongly curved. Phallosome with aedeagus a slender straight rod, subtended by longer parallel needlelike gonapophyses. Ovipositor with cerci long, strongly upcurved to the acute tips, hypovalvae short and stout.

Biology. The immature stages of the African *Conosia angustissima* Alexander have been described by H. G. Wood (1952, Ann. South African Mus., 39: 254–261, fig. 83 (adult), fig. 84 (larva), fig. 85 (pupa) with excellent illustrations. The early stages were found in wet sandy gravel and reddish silt at margins of small trickles of water some two or three inches in depth. The pupae and their cast skins occurred in the drier regions of the low stream banks.

Concerning the adults, R. C. McGregor, in Luzon (Alexander, 1927, Philip. J. Sci., 33: 299) provided notes on the genotype, *irrorata*, as follows: "rests on leaves with a hind leg extended on either side, mid and fore legs placed together and extended in front, abdomen elevated, motionless. In such a position the insect simulates certain spiders and looks nothing like a fly."

53. Conosia insularis Alexander (figs. 111, 112)

Conosia irrorata insularis Alexander, 1942, Tipulidae of Guam, *in* Insects of Guam, -I, Bull. B. P. Bishop Mus., **172:** 198.

MALE: Length about 9–10 mm.; wing 6.5–7.5 mm.

FEMALE: Length about 12–14 mm.; wing 8.5–10 mm.

Antennae with scape dark brown, pedicel and flagellum more yellowed. Head and thorax almost uniformly light brown, stripes on praescutum scarcely differentiated, interspaces with darker brown setigerous spots. Halteres with stem yellow, knob brown. Legs with coxae obscure brownish yellow; remainder of legs yellow, in some specimens fore femora darkened except basally, femora and tibiae with tips narrowly dark brown. Wings (fig. 112) pale brown, all veins with series of small brown dots, with larger areas at stigma, origin of *Rs* and outer end of vein R_3; crossveins in costal cell narrowly seamed with brown, with a concentration of these elements beyond midlength of cell and opposite origin of *Rs* darker brown. Wings of male not conspicuously dilated at termination of vein *2nd A*, as in *irrorata* (fig. 111). One male specimen (Ponape) has the darkened spots along the veins larger and more conspicuous, certain of the marks almost crossing the cells; veins yellow in the ground, darker in the spotted areas. Abdomen brownish yellow, darker outwardly.

Some materials from the Palau Islands have the wing spots smaller and somewhat more abundant than the types from Ponape.

DISTRIBUTION: Caroline Is. (Palau, Yap, Ponape).

PALAU. BABELTHUAP: Marukyoku (Melekiok), Feb. 23, 1936, Esaki (KU; type material). Iwang, alt. 8 meters, Dec. 19, 1952, Gressitt (BISHOP). MELEKEIOK: May 22, 1957, Sabrosky (US). Ngiwal, alt. 1 meter, Dec. 16, 1952, at light, Gressitt (BISHOP); May 20–21, 1957, at light in jungle, Sabrosky (US). KOROR: Jan. 11, 1953, Beardsley (BISHOP).

YAP. KOLONIA: Jan. 12–17, 1953, Gates Clarke (US); June 21, 1957, Sabrosky (US). Mt. Matade, alt. 60–95 meters, Dec. 1–2, 1952, light trap,

conspicuous black trichia, lacking near the wing base. Venation: *Sc* short, Sc_1 ending from

about one-third to nearly opposite midlength of *Rs*, Sc_2 shortly removed; vein R_2 slightly oblique, subequal to R_{2+3+4}, R_3 about two-thirds of R_4; *m-cu* subequal to M_{3+4}.

Abdominal tergites dark brown, sternites yellowed; hypopygium brownish yellow. Male hypopygium (fig. 119) with the outer dististyle, *d*, deeply bifid, the arms longer than the stem, outer arm more slender, apex narrowly obtuse, inner arm shorter, slightly widened outwardly, apex truncate; inner style slender, slightly broader outwardly, tip obtuse.

DISTRIBUTION: Eastern Caroline Is. (Kusaie I.).

Holotype, male (US 72348), Hill 1010, Kusaie I., alt. 300 meters, Feb. 4, 1953, Gates Clarke. Allotopotype, female (US). Paratopotypes, 2 males, one badly broken. Paratypes, Matunluk (Matanluk), Kusaie, alt. 22 meters, light trap, Feb. 6, 14, and March 30, 1953, Clarke (US). Ye pan, Matanluk, Jan. 24, 1953, light trap, Gressitt (BISHOP).

I take pleasure in dedicating this fly to Dr. John Gates Clarke, distinguished student of the Lepidoptera, who has collected Tipulidae on many widely separated Pacific Islands. The species is one of the smallest so far discovered in Micronesia. It is readily told from the only other regional member of the genus, *Cheilotrichia* (*Cheilotrichia*) *palauensis*, by the very different coloration of the thorax, antennae and legs.

Genus **Erioptera** Meigen

Polymeda Meigen, 1800, Nouvelle classification des Mouches á deux ailes (Diptera L.) d'après un plan tout nouveau, p. 14. Name suppressed by the International Commission on Zoological Nomenclature, 1963, Opinion 678, Bul. Zool. Nomenclature, **20:** 339–342.

Erioptera Meigen, 1803, Illiger's Mag. Insektenkunde, **2:** 262 (type: *lutea* Meigen). The type selection of *grisea* by Blanchard is rejected by the present author since it is not a member of this genus (in *Molophilus* Curtis).

Chemalida Rondani, 1856, Prodromus Dipterologiae Italicae, p. 180 (type: *taenionota* Meigen).

Ilisophila Rondani, 1856, Prodromus Dipterologiae Italicae, p. 180 (type: *lutea* Meigen).

Limnoea Rondani, 1856, Prodromus Dipterologiae Italicae, p. 181 (type: *flavescens* Linnaeus). Considered to be preoccupied by *Limnaea* Poli, 1791; re-named *Limnoica* Rondani, 1861, Prodromus Dipterologiae Italicae, 4 (Corrigenda), p. 11.

Erioptera is a major genus in the family, including several valid subgenera and with further closely related genera that formerly were believed to belong in this genus. There presently are known some 300 species that occur in all biotic regions, most numerous in the Holarctic, Oriental and Neotropical. The only subgenus so far discovered in Micronesia is *Meterioptera* Alexander, discussed herewith.

Subgenus **Meterioptera** Alexander

Erioptera (*Meterioptera*) Alexander, 1934, Philip. J. Sci., **53:** 462 (type: *javanensis* de Meijere).

Other Oriental species that are placed here include *Erioptera* (*Meterioptera*) *bengalensis* Alexander, India; *E.* (*M.*) *ensifera* Alexander, Formosa; *E.* (*M.*) *fervida* Alexander, Mindanao; *E.* (*M.*) *festiva* Alexander, Mindanao; *E.* (*M.*) *geniculata* Edwards, Mindanao, Borneo, Micronesia; *E.* (*M.*) *halterata* Brunetti, India; *E.* (*M.*) *insignis* Edwards, Formosa; *E.* (*M.*) *luzonica* Alexander, Luzon; *E.* (*M.*) *notata* de Meijere, Java, Ceylon to Sumatra; and a few others. Australasian species include *E.* (*M.*) *angustifascia* Alexander, Australia; *E.* (*M.*) *bicornifera* Alexander, Hawaii; *E.* (*M.*) *caledoniae* Alexander, New Caledonia; *E.* (*M.*) *ochracea* Skuse, Australia; *E.* (*M.*) *simulans* Alexander, Australia; *E.* (*M.*) *thaumasta* Alexander, Solomon Islands; and others.

Antennae with proximal three or four segments of flagellum united into a short truncate-conical fusion segment, the organ thus appearing to have fewer than the normal Eriopterine number of sixteen antennal segments. Legs with appressed linear scales among the slightly longer normal setae. Wings (figs. 115, 116) with vein *Sc* long, Sc_1 ending beyond fork of *Rs*, Sc_2 far retracted, Sc_1 long, commonly subequal in length to *Rs*. *Rs* with three branches, R_3, R_4 and R_5; cell R_3 deep, greatly exceeding its petiole (vein R_{2+3+4}); cord of wing beyond midlength; cell M_2 commonly open by atrophy of *m;* vein *2nd A* moderately sinuous, including about the outer fifth, not strongly constricting the cell as in typical *Erioptera*. Male hypopygium (fig. 120) with tergite not inverted. Dististyles, *d*, virtually terminal, the basistyle, *b*, with a small terminal lobe; outer style nearly straight, apex slightly dilated, with a concentration of microscopic spines; inner style long and slender, before midlength bent at a right angle and extended into a long straight spine. Phallosome, *p*, with gonapophyses, *g*, appearing as long curved sicklelike spines; aedeagus at apex divided into two long recurved rods, about as in typical *Erioptera*.

The group is most nearly related to the subgenus *Ctenerioptera* Alexander (Pacific Insects, 1961, 3: 503—type: *pectinella* Alexander), with relatively few species ranging from southern India eastward to New Guinea. The Australasian species of these two groups still are poorly known and some probably are incorrectly assigned to subgenus at the present time.

Nothing appears to be known concerning the early stages of species in this subgenus. Members of other subgeneric groups in the genus *Erioptera* where the immature stages have been discovered occur in the wet earth along streams or in swamps and bogs, and it may be presumed that *Meterioptera* will be found to have similar habits.

56. Erioptera (Meterioptera) geniculata Edwards (figs. 115, 116, 120)

Erioptera geniculata Edwards, 1931, J. Fed. Malay States Mus., **16:** 498–499.

Erioptera (*Meterioptera*) *geniculata:* Alexander, 1934, Philip. J. Sci., **53:** 464.

MALE: Length about 2.5–3 mm.; wing 2.8–3.5 mm.

FEMALE: Length about 3–4 mm.; wing 3.5–4 mm.

Antennae pale brown to blackish (type). Head light to dark brown (type); orbits conspicuously silvery white. Thoracic dorsum brownish yellow to fulvous, surface dull; praescutal setae long, erect, black; pleura chiefly silvery white. Halteres light yellow to brownish (type). Legs with femora brownish yellow, tip whitened, preceded by a subequal pale to darker brown ring, in some specimens this much paler to virtually obsolete; tibiae and tarsi pale yellow, darker in type; abundant linear scales interpolated among the longer normal setae. Wings (fig. 116) faintly darkened, prearcular and costal fields light yellow; a narrow light brown seam over cord from vein R_2 through *m-cu;* veins yellow, darker in the patterned areas, trichia dark. Venation: Sc_1 ending opposite R_2; R_{2+3+4} short, subequal to or shorter than R_{2+3}, vein R_2 short; *m-cu* at or before fork of *M;* vein *2nd A* with nearly the outer third gently sinuous.

Abdominal tergites obscure yellow, sternites and hypopygium clearer yellow, subterminal tergites weakly darkened basally. Male hypopygium (fig. 120) with apical lobe of basistyle, *b*, bearing three or four long stout pale setae that are about two-thirds as long as the lobe. Outer dististyle, *d*, simple, slightly constricted at near midlength, apex with dense appressed curved blackened spines, the inner two or three larger; inner style with extreme base stout, the remainder bent at a right angle, the outer two-thirds a long straight slender spine that narrows to the acute tip, this spine slightly longer than the outer style. Phallosome, *p*, with gonapophyses, *g*, appearing as long curved sickles. Arms of aedeagus long and slender, strongly bent beyond midlength.

The type, a female, was from lowland stations in north Borneo. Later it was recorded from Mindanao by Alexander (l.c.).

DISTRIBUTION: Borneo, Mindanao; Micronesia (Caroline Islands).

PALAU. BABELTHUAP: Airai, Ngarsung, May 11, 1957, Sabrosky (US); Melekeiok, May 22, 1957, Sabrosky (US); Ngaremlengui, June 2–3, 1957, at light, Sabrosky (US): Ngerehelong, May 6–8, 1957, at light, chiefly females, Sabrosky (US); Ulimang, Dec. 16, 1947, Dybas (CM); Ngiwal, alt. 1 meter, light trap, Dec. 16, 1952, Gressitt (BISHOP); May 20–21, 1957, at light, Sabrosky (US). KOROR: April 27–28, 1957, at light, Sabrosky (US); Sept. 16, 1952, April 6—25, 1953, at light, females, Beardsley (BISHOP); Dec. 5–17, 1952, light trap Gressitt (BISHOP).

YAP. Gagil, Gachapar, June 19, 1957, at light, Sabrosky (US); Giliam, June 10, 1957, Sabrosky (US); Kolonia, June 21, 1957, at light, Sabrosky (US); Weloy, June 20, 1957, Sabrosky (US); Yap, hill behind Yaptown, alt. 50 meters, Nov. 28—Dec. 2, 1952, light trap, Gressitt (BISHOP). Rumung. June 17, 1957, Sabrosky (US).

The Australian species *Erioptera* (*Meterioptera*) *angustifascia* still is known to me only by the unique female type, taken at Meringa, North Queensland, in 1918, by Illingworth. The venation of the type is shown (fig. 115) and attention is directed to the outer radial field (subfigure) especially the long vein R_{2+3+4} and the reduced R_{2+3} that is shorter than R_2. The discovery of the male sex should produce stronger characters for the separation of the two species.

Genus **Styringomyia** Loew

Styringomyia Loew, 1845, Dipt. Beiträge, **1:** 6; correct spelling should have been *Syringomyia* (in litt., Bergroth to Alexander) (type: *venusta* Loew, fossil in copal; *pulchella* Loew, nomen nudum). Fossil in Baltic Amber, (Upper Eocene, *gracilis* Loew, nomen nudum).

Styringia Berendt, 1845, Die im Bernstein befindlichen organischen Resten der Vorwelt, **1:** 57 (no type designated; Baltic Amber).

Idiophlebia Grunberg, 1903, Zool. Anzeig., **26:** 524–528, figs. (type: *didyma*, as *pallida* Grünberg).

Pycnocrepis Enderlein, 1912, Zool. Jahrb., Syst., 32, part **1:** 65, figs. (type: *annulipes* Enderlein).

Mesomyites Cockerell, 1917, Proc. U. S. Nat. Mus., **52:** 377, fig. (type: *concinna* Cockerell; fossil, Oligocene).

Special references:

Alexander, C. P., 1947, Rev. Ent., **18:** 354–356.

Edwards, F. W., 1914, Trans. Ent. Soc. London, 1914: 206–227, 7 plates, with 81 figs.

Hardy, D. E., 1960, Insects of Hawaii, 10, Diptera: Nematocera-Brachycera, pp. 45–46, fig. 5.

Styringomyia is of special interest in being the only valid genus of Tipulidae that was first described as fossil and later was found to have living representatives. Presently more than 100 species are known, virtually all being Palaeotropical, with about 25 species in the Australasian region chiefly from New Guinea and its satellite islands. A few species are Neotropical, all entirely distinct from the Old World forms. Two species from Micronesia are known and are discussed later.

Head rounded or slightly longer than broad, narrowed behind; eyes separated by anterior vertex, the latter broader than the exposed part of eye. Posterior vertex with three pairs of strong setae, with two further pairs of smaller bristles behind the eyes, with a few still smaller hairs on occiput. Rostrum short, not exceeding one-half the remainder of head; maxillary palpi four-segmented, first segment only slightly longer than thick, second and third segments slightly longer, fourth more slender, cylindrical, about one-half longer than either the second or third. Antennae 16-segmented, scape cylindrical, about two and one-half times as long as broad, pedicel nearly round; flagellar segments oval, outwardly slightly decreasing in size, the sparse stiff verticils at near midlength.

Thorax with prothorax well-developed, pronotum with a transverse suture, anterior part roughly triangular in outline, with a row of about ten strong setae projecting cephalad over the occiput, posterior part more or less horseshoe-shaped, with two strong setae on either side. Mesonotum with abundant setae on praescutal interspaces and elsewhere. Legs with fore and hind pairs longer than the middle legs; tibial spurs lacking; all segments with dense appressed pale setae, femora and tibiae with scattered erect darker bristles of various sizes, evidently of value as specific characters. Wings (figs. 117, 118) with a characteristic venation, with both

veins *Sc* and R_1 ending about at or before midlength of wing; anterior arculus lacking; vein *R* strongly arched or bent opposite the arculus. *Sc* short, Sc_1 approximately opposite or shortly beyond origin of *Rs;* vein R_1 short, ending before to shortly beyond midlength of *Rs*, R_2 lacking, *Rs* long, its anterior branch, interpreted as being R_4, short, oblique to suberect, cell R_4 at margin extensive, posterior branch (R_5) very long. Media with cell *1st* M_2 long and narrow, nearly parallel-sided, comprised of vein M_3 behind, this commonly uniting with M_{1+2} at end of the cell, in cases the vein fused with M_{1+2} to form a short to longer element, M_{1+2+3}, cell *2nd* M_2 thus appearing to be short-petiolate, in rarer cases crossvein *m* preserved as a short element; *m-cu* commonly about its own length beyond fork of *M*, in cases to nearly midlength of M_{3+4}. Vein *2nd A* elongate, simple or, in cases, angulated and spurred near outer end. Costal fringe long and conspicuous; trichia of anterior wing veins variable, in cases virtually restricted to a few weak trichia on distal section of R_5*;* in *sabroskyi* with numerous trichia on veins beyond cord, including also *Rs*, *M*, except at base and over the entire length of *2nd A*, lacking on *Cu* and *1st A*.

Abdomen of male with basal segment longer than wide, segments two to seven subequal in length, about twice as long as wide, segment eight very short. Male hypopygium (figs. 121, 122) with ninth tergite, *t*, and sternite inverted to 180 degrees, the tergite thus being ventral in position, the sternite dorsal. Tergite usually broad, sternite more narrowed. Basistyle, *b*, with outer lobe commonly bearing one or two powerful spinoid setae. Dististyle, *d*, a single complex structure, usually with a long slender outer arm that bears a single nearly terminal seta, the inner two or three arms of style flattened, variously armed with groups or rows of blackened peglike spinoid setae. Phallosome, *p*, including the central aedeagus, in the various species modified to provide strong characters for specific recognition. Ovipositor of female with both the cerci and hypovalvae short and fleshy, of various forms in the different species to provide good recognition characters.

Biology. The commonest species in Micronesia, *Styringomyia didyma*, is the only species whose life history is satisfactorily known. Observations were made by Mr. F. W. Terry and discussed by Perkins: "about 45 eggs were deposited in a tube on December 5, 1910. Chorion jet black, shining and thick, resisting dryness, 0.3 by 0.15 millimeters, surface very finely parallel-striate. One egg hatched on December 10th. The batch was placed with rotten apples and cow manure, hatching December 15th. Larva long, head small, mandibles distinct and well chitinized. An adult male emerged about January 21, 1911". Further data were sent to the author by O. H. Swezey, as follows: "the striking feature of this life history is its brevity, the entire egg, larval, and pupal stages being passed in about a month and a half. Alexander states that he knew of no other crane-flies in which this was equalled". (Alexander, 1920, Crane-flies of New York, **2:** 959).

In West Africa, Dr. A. Ingram made brief observations on the immature stages of three further species that were discussed briefly by Edwards (Ann. Mag. Nat. Hist., 1924, 9 **13:** 267–268). *Styringomyia ingrami* Edwards and *S. obscuricincta* Edwards were bred from materials found in rotting banana fibre, while *S. crassicosta* Speiser was reared from a rotting prostrate palm tree. The larva was not preserved but the pupa of *ingrami* has been described by

Edwards (l.c.). "The pupa shows some very interesting features, and may be briefly described as follows: Head with four small rounded tubercles on the face; front with a pair of large conical tubercles, each bearing a short, stout, terminal seta. Prothoracic breathing-horns very short, somewhat flattened, and widened apically, with a terminal row of minute apertures. Behind the breathing-horns on the praescutum are four large, bluntly rounded tubercles, the inner pair larger than the outer, and all finely papillose. Behind these again are four minute tubercles, placed more widely apart, and each bearing a short seta. Wing-sheaths reaching nearly to the end of the second abdominal segment, leg-sheaths to just beyond the end of the third; ends of tarsal sheaths almost level, the middle pair only very slightly shorter. Tergites and sternites of first seven abdominal segments each with a row of about twenty minute, close-set, minutely spinose tubercles near the posterior margin; pleurites with only two or three similar but somewhat larger tubercles. Eighth segment without obvious spiracles; with a pair of widely separated conical dorsal tubercles, and another pair of more pointed lateral tubercles, these being somewhat bifid. Ninth segment with two pairs of dorsal projections, the first smaller and bluntly conical, the second larger, more pointed, and hook-like; also a small pair of ventral tubercles. The eighth and ninth segments are much alike in the two sexes, except that the male has the genital sheaths more prominent. The whole pupal integument is uniformly chitinized". Further observations are included in Macfie, J. W. S., and A. Ingram, 1923. Certain nurseries of insect life in West Africa., Bull. Ent. Res., **13:** 291–294.

Habits of adults. Interesting observations concerning the adults are available and some are cited herewith.

Styringomyia didyma Grimshaw. "It sometimes swarms at night around the electric lights, sitting quietly on the walls and ceilings, with the body pressed closely to the surface, and the front and middle legs extended straight forward in front of the head in a characteristic manner". Perkins, R. C. L., 1913, Fauna Hawaiiensis, 1: clxxxii.

Styringomyia ceylonica Edwards. "The species rests on walls with the two anterior pairs of legs stretched out straight in front and the posterior pair behind, resembling a stray piece of cobweb".—observations by Annandale, in India, cited by Edwards.

Styringomyia jacobsoni Edwards. "The flies are attracted to lamps and are almost always to be found in copulation, the head of one directed away from the other, while thus engaged, sometimes one, sometimes the other, will run forward for a short distance, producing a peculiar appearance".—observations by Jacobson, in Java, cited by de Meijere, 1911, Tijdschr. Ent., 54: 41–42.

Styringomyia vittata Edwards. Two specimens were taken in "cop", settled on under side of a twig, heads in opposite directions, front legs of each stretched out in front along twig, wings laid flat along abdomen".—observations in the Transvaal, South Africa, by H. K. Munro (through Alexander, 1920, Crane-flies of New York, 2: 958).

Key to Micronesian Species of Styringomyia

1. General coloration of body yellow, restrictedly patterned with brown; halteres yellow; legs yellow, femora and tibiae variegated by brown spots; wings yellow, with small brown spots on disk, veins yellow; anterior branch of *Rs* (R_4) short, suberect; male hypopygium (fig. 121) without paired brushes of setae near apex of aedeagus.. **57. didyma**

   General coloration of body blackened, restrictedly patterned with yellow; halteres and legs dark brown to black; wings infuscated, without pattern, veins brown; anterior branch of *Rs* (R_4) long, oblique; male hypopygium with paired brushes of black setae near apex of aedeagus.. **58. sabroskyi**

57. Styringomyia didyma Grimshaw (figs. 117, 121)

Styringomyia didyma Grimshaw, 1901, Fauna Hawaiiensis **3**(1): 10.—Edwards, 1914, Trans. Ent. Soc. London, 1914: 222–223, figs. 38, 39 (male hypopygium), fig. 76 (ovipositor).—Hardy, 1960, Insects of Hawaii, Diptera: Nematocera-Brachycera 10, pp. 45–46, figs., venation, male hypopygium.

Idiophlebia pallida Grünberg, 1903, Zool. Anzeig., **26:** 524–528, 5 figs.

The type of *didyma* was from Honolulu, Hawaii, collected in November 1896 by Perkins. The type of *pallida* was from Yap Island, Caroline Islands, taken by Volkens.

Male: Length about 6.5–7 mm.; wing about 4–4.5 mm.

Female: Length about 5–6 mm.; wing 4–4.2 mm.

Rostrum and palpi brown to dark brown. Antennae with scape and pedicel dark brown, the former yellowish gray above; flagellum yellowish brown to light brown. Head above yellowed, posterior vertex brown, with a narrow yellow central line that is continued caudad onto the otherwise dark brown anterior pronotum, the latter with strong porrect black setae, pronotal scutellum testaceous yellow.

Mesonotal praescutum chiefly yellow, including the sides, central parts and scutal lobes extensively patterned with dark brown, the latter forming U-shaped areas; scutellum and postnotum chiefly brownish black, yellowed medially, especially the former; pleurotergite and pleura chiefly light yellow. Halteres yellow. Legs yellow, femora above on outer half with two darkened areas that form incomplete rings; fore and middle tibiae with a narrow darkening before midlength, tips of all tibiae narrowly dark brown; tarsi yellow, terminal segment brownish black. Wings (fig. 117) yellow, with three darkened clouds on disk, including the veins, placed at *r-m*, outer end of cell *1st* M_2 and over *m-cu;* in cases a further less evident darkening includes the outer end of the simple vein *2nd A*.

Abdomen yellow, posterior borders of tergites with paired brown spots, on sixth segment the areas more approximated or united, seventh tergite with a complete darkened central

line; hypopygium yellow. Ovipositor with the cerci deeply bifid to form two lobes, the tips of all four elements extended into long blackened setae; hypovalvae simple, of approximately the same shape and size but lacking the strong setae. Male hypopygium (fig. 121) with ninth tergite, *t*, produced caudally, sides almost parallel, apex truncated or insensibly emarginate, surface with abundant delicate setulae. Sternite, *s*, narrow, profoundly emarginate, the slender lobes about one-half as broad as the emargination, each tipped with a strong seta that is subequal in length to the lobe, with a second subequal bristle on lateral margin of lobe at near two-thirds the length. Basistyle, *b*, with a single modified seta from a very long basal tubercle. Dististyle, *d*, with outer arm a swordlike blade, pale and flattened on proximal half, outer end narrowed into a long slender black spine; intermediate and inner arms flattened, opposable to one another, each with a short comb of about 12 to 15 blackened spinoid setae, inner arm with a slender smooth paddlelike blade bearing a small blackened point. Phallosome, *p*, with recurved lateral arms.

DISTRIBUTION: Micronesia (Mariana, Caroline, Marshall, and Gilbert Is.); elsewhere widespread in the Pacific area, including Fanning Island, Fiji, Hawaii, New Guinea, New Hebrides, Samoa, Society Islands, Solomons, Tuamotu Archipelago, and elsewhere.

MARIANA. GUAM: Agat, May 20, 1931 Usinger (BISHOP); Piti, April 30, 1931, Usinger (BISHOP); Point Oca (NAMRU 2), May, June 18–28, July 16, at light, G. E. Bohart, Gressitt (US); Ritidian Point, April 22, 1936 Bryan (BISHOP); Sumay Road, June 23 Usinger (BISHOP); July 15, 1936 Swezey. SAIPAN: near Lake Susupe, Feb. 1, 1945, Dybas (CM). TINIAN: Oct. 16, 1945, Dybas (CM); Nov. 11, 1952, at light, Beardsley (US).

PALAU. BABELTHUAP: Ngiwal, May 19, 1957, light, Sabrosky; Melekeiok, May 22–23, 1957, at light, Sabrosky (US); Ngaremlengui, June 4, 1957, Sabrosky; Ulimang, Dec. 10–26, 1947, at light, Dybas (CM, BISHOP). KOROR (Koror): Korror-Arbaketsu, May 30, 1938, Shiro Murakami (KU); Jan. 26, April 2, May 2, 1953, at light, Beardsley (US). PELELIU: East coast, Aug. 12, 1945, Dybas (CM); north-central, July 28—Aug. 12, 1945, at light, Dybas (CM); Aug. 10, 1945, at light, H. C. Ducoff (BISHOP); Aniangal Mt., Dec. 22, 1952, light trap, Gressitt (BISHOP); Angaur, Feb. 3, 1948, Dybas (CM). NGURUKDABEL: Ngaremediu, April 24, 1957, Sabrosky (US). NGAIANGL A. (Kayangel); Dec. 15, 1952, sweeping, at light, Gressitt; May 9, 1957, Sabrosky (US).

ELATO. Feb. 4–5, 1953, Beardsley (US). IFALUK. IFALUK: Feb. 7, Aug. 1953, Bates (Bishop). KUSAIE I., Hill 541, alt. 165 meters, April 29, 1953, light trap; MUTUNLIK (Matanluk); altitude 22 meters, Jan. 23–31, Feb. 6–15, March 20, April 21, Gates Clarke (US); Yepan, January 23–24, 1953, at light, Gressitt (BISHOP); Malem, Dec. 18, 1937, Esaki (KU). LAMOTREK A. LAMOTREK (Lamotrik) I., Feb. 5, 1953, Beardsley (US); September 23, 1952, Krauss (BISHOP). PINGELAP. Jan. 26, 1953, Gressitt (BISHOP). WOLEAI. FALALIS: Sep. 20, 1952, Krauss. WOLEAI: Sep. 19, 1952, Krauss

(BISHOP). TRUK. Ton: Pata, Sabote-Epin, April 5, 1940, Yasumatsu-Yoshi (KU). YAP. Type specimen of *Idiophlebia pallida* (Volkens). Dugor-Rumu, altitude 10 meters, Nov. 29, 1952, Gressitt (BISHOP); Giliman, June 10, 1957, at light, Sabrosky (US); Kolonia, June 13, 1957, Sabrosky (US). Rumung: June 17, 1957, at light, Sabrosky (US); Yap Gr., August 1952, Krauss (BISHOP)

MARSHALL IS. Arno A.: Ine I., Aug. 8, 1950, LaRivers (BISHOP). Jaluit A.: Jabor, Nov. 28, 1937, Esaki (KU). Majuro A.: Ulika (Uliga) I., Nov. 1–12, 1953, Beardsley (US). Namorik A.; Namorik I., Sep. 30, 1953, Beardsley (BISHOP).

GILBERT IS. Tarawa A.: Bairiki I., Nov. Dec. 1957, Krauss (BISHOP).

58. Styringomyia sabroskyi Alexander, n. sp. (figs. 118, 122)

General coloration blackened, head and pronotum restrictedly patterned with obscure yellow; halteres and legs dark brown to brownish black; wings strongly and uniformly blackened, *Rs* in direct longitudinal alignment with its posterior branch, the anterior branch oblique; male hypopygium very distinctive, including all structures; aedeagus depressed-flattened, before apex on either side with a dense brush of about 18 long black setae.

Male: Length about 7 mm.; wing 5 mm.

Female: Length about 4.5–5 mm.; wing 3.8–4.2 mm.

Rostrum and palpi black. Antennae with scape blackened beneath, yellow above, pedicel obscure yellow, flagellum black; flagellar segments short-oval to subglobular, the outer ones more oval, a little shorter than the longest verticils, each with a short abrupt apical pedicel. Head brownish black, more conspicuously so behind, restrictedly patterned with obscure yellow on orbits and on sides of posterior vertex behind the eyes, genae darkened; vestiture of anterior vertex long, of posterior vertex very short but relatively abundant.

Pronotum yellowed above, narrowly blackened on sides; anterior half of pronotum deeply emarginate medially, either side with three major setae, the horseshoe shaped posterior half with a powerful seta on either side. Mesonotal praescutum with three gray stripes, interspaces more blackened, lateral borders and humeral region narrowly yellowed; scutal lobes blackened, with a small yellow posterior spot; scutellum blackened, more yellowed medially; mediotergite brown, grayish pruinose. Pleura brown, slightly pruinose, with a narrow more blackened longitudinal stripe on dorsal margin. Halteres dark brown. Legs dark brown to brownish black, extreme base of tibia yellowed. Wings (fig. 118) strongly and uniformly infuscated, veins darker. Macrotrichia on most longitudinal veins beyond general level of origin of *Rs*, including also *C*, *Sc*, *R*, and *2nd A*, lacking on *Cu* and *1st A*. Venation: *Rs* in direct longitudinal alignment with its posterior branch, anterior branch oblique, arising at the fork; cell *2nd* M_2 broadly sessile; *m-cu* less than its own length beyond fork of *M;* vein *2nd A* curved gently to margin.

Abdominal tergites almost uniformly dark brown, basal sternites brownish yellow. Ovipositor blackened; tergal valves slender, more narrowed at outer ends which bear two long setae; hypovalvae shorter and stouter, appearing as flattened fingerlike lobes. Male hypopygium (fig. 122) very distinct from all other described species, including especially the tergite, sternite and basistyle. What is interpreted as being the tergite, *t*, is a depressed-flattened plate, posterior border broadly extended, apex very shallowly emarginate to produce rounded lobes that are provided with abundant small setae. Sternite, *s*, broadly oval, depressed-flattened, yellow, with very numerous microscopic setulae. Basistyle, *b*, at inner apical angle with a conspicuous blackened rod from a paler expanded base, stem straight, its outer margin with a series of

small blackened recurved points, apex obtuse. Dististyle, *d*, single, outer apical lobe long and narrow, with long setae, the two apical ones apparently larger (setae broken, punctures large, actual size of setae unknown); inner armature of style complex, as shown by the subfigures, including a strong pale lobe at base of the outer one, its outer margin with dense long black setae, the more basal ones strongly recurved, outer setae much smaller but conspicuous; two inner arms present, the larger a flat blackened blade that is more expanded outwardly, the margin with about a dozen conspicuous spines, smaller arm at its base, unequally bilobed, the longer lobe with two strong setae, the smaller more basal lobe with a longer more slender bristle; between these two inner arms a low flattened yellow cushion provided with dense short yellow setae. Aedeagus, *a*, depressed-flattened, apex slightly narrowed, obtuse, before tip on either side with a dense brush or cluster of about 18 long black setae; more basally on aedeagus on either side of midline with a small group of about four small stout spinoid setae. The hypopygium is quite distinct from that of all other presently known regional species. Comparisons may be made with two African species, especially *Styringomyia stuckenbergi* Alexander, which has somewhat similar groups of setae on the aedeagus and also with a powerful modified lobe on inner face of basistyle, both structures quite different from those of the present fly. *S. xenophallus* Alexander likewise has the aedeagus greatly modified and in some regards suggests that of the present fly.

DISTRIBUTION: Caroline Is. (Palau)

Holotype, female (US 72349), Koror I., northeast, April 26, 1957, Sabrosky. Allotopotype, male (US), Koror, Dec. 14, 1952, at light, Beardsley. Paratopotypes, 2 females, Koror, northeast, altitude 40 meters, on limestone ridge, Dec. 14, 1952, Gressitt (BISHOP, one ALEX).

This especially distinct species is named for the collector of the type specimen, Dr. Curtis Sabrosky, distinguished student of the higher Diptera. The superficially most similar regional species are *Styringomyia fumosa* Edwards and *S. terrae-reginae* Alexander, which differ in coloration of the body, legs, and wings and, especially in the very different male hypopygia.

Genus **Gonomyia** Meigen

Gonomyia Meigen, 1818, Syst. Beschreib. europ. Zweifl. Insekten, **1:** 146 (type: *tenella* Meigen).

Goniomyia Osten Sacken, 1869, Mon. Diptera North America, **4:** 176, 179. (emendation of last).

Gonomyia is one of the major genera in the Tipulidae with more than 600 species occurring in all biotic regions. In a recent paper on the Oriental species by the writer (Philippine Jour. Sci., 1967, **96:** 29–71, 75 figs.) the 15 subgeneric groups then known were listed. To indicate the general distribution, the Neotropical region has 216 species, in 8 subgenera; Nearctic 59 species in 7 subgenera; the Oriental 216 species in 10 subgenera, as listed in the latest Alexander and Alexander catalogues covering these areas. Of the recognized subgenera, only *Lipophleps* Bergroth presently is known from Micronesia.

Subgenus **Lipophleps** Bergroth

Lipophleps Bergroth, 1915, Psyche, **22:** 55; re-naming of *Leiponeura* Skuse, 1890, preprint 1889, Proc. Linn. Soc. New South Wales, 2 **4:** 795 (type: *skusei* Alexander, as *gracilis* Skuse, preoccupied; 1919, Ann. Ent. Soc. America, **12:** 30).

Lipophleps is one of the largest subgenera in *Gonomyia*, with representatives in all regions, including New Zealand and Madagascar. It is widely distributed throughout the Pacific area.

Size usually small (wing commonly less than 4 mm., in local forms). Some much larger species have been assigned to the subgenus but it appears that these actually do not belong here, such species including *dicranura* Edwards, Samoa; *flavidapex* Edwards, Tahiti; and *metallescens* Edwards, Marquesas. Antennae short, 16-segmented, all flagellar segments distinct. Legs without tibial spurs or these represented by two slightly enlarged setae on middle and posterior tibiae, as discussed by Edwards (1938). Mesonotal praescutum with tuberculate pits far cephalad. Meron small, the middle and hind coxae correspondingly approximated. Wings (figs. 123, 124, 125) with veins *h* and interanal crossvein placed more proximad than the remaining elements of basal cord. Vein *Sc* short, Sc_1 opposite or before origin of *Rs;* vein R_2 lacking. Cell R_3 present in *gressittiana* (fig. 123), lacking in other local species (figs. 124, 125), in these the branches present being R_4 and R_5; cell *1st* M_2 commonly closed; *m-cu* at or near fork of *M*. Male hypopygium (figs. 130–133) with two dististyles; phallosome complex in structure.

The immature stages of *Gonomyia*, including *Lipophleps*, occur in wet sandy soil near water.

Key to Micronesian Species of Gonomyia (Lipophleps)

1. Wings (fig. 123) with cell R_3 present, *Rs* thus with three branches (R_3, R_4, R_5)... ....**60. gressittiana**
   Wings (figs. 124, 125) with cell R_3 lacking, *Rs* with two branches (R_4, R_5)...............2
2. Legs with femora uniformly infuscated..............................3
   Legs with femora apically ringed with dark brown and yellow...............5
3. Wings darkened, costal border narrowly yellowed, certain of the cells with paler centers; male hypopygium with basistyle not produced, the two dististyles terminal......4
   Wings more weakly darkened, costal border not evidently yellowed, cells without pale centers; male hypopygium with apex of basistyle produced beyond base of the single dististyle..................**61. intrepida**
4. Size small (wing less than 3 mm.); male hypopygium (fig. 132) with inner dististyle small, entirely pale, not produced..................**63. secreta**
   Size larger (wing more than 3 mm.); hypopygium (fig. 133) with inner dististyle produced into a slender spine that is longer than the outer style.........**64. yapensis**
5. Wings uniformly brownish yellow, unpatterned, stigma scarcely indicated; femora dark brown with a narrow yellow subterminal ring; male hypopygium without a setiferous cushion at base of middle dististyle..................**59. esakiella**
   Wings pale, clouded with gray, with further restricted darker brown spots at tip of vein *Sc*, along cord and at end of vein R_3; femora yellow, outwardly with two brown rings, the terminal one broader; male hypopygium (fig. 130) with a setiferous cushion at base of intermediate dististyle..................**62. pietatis**

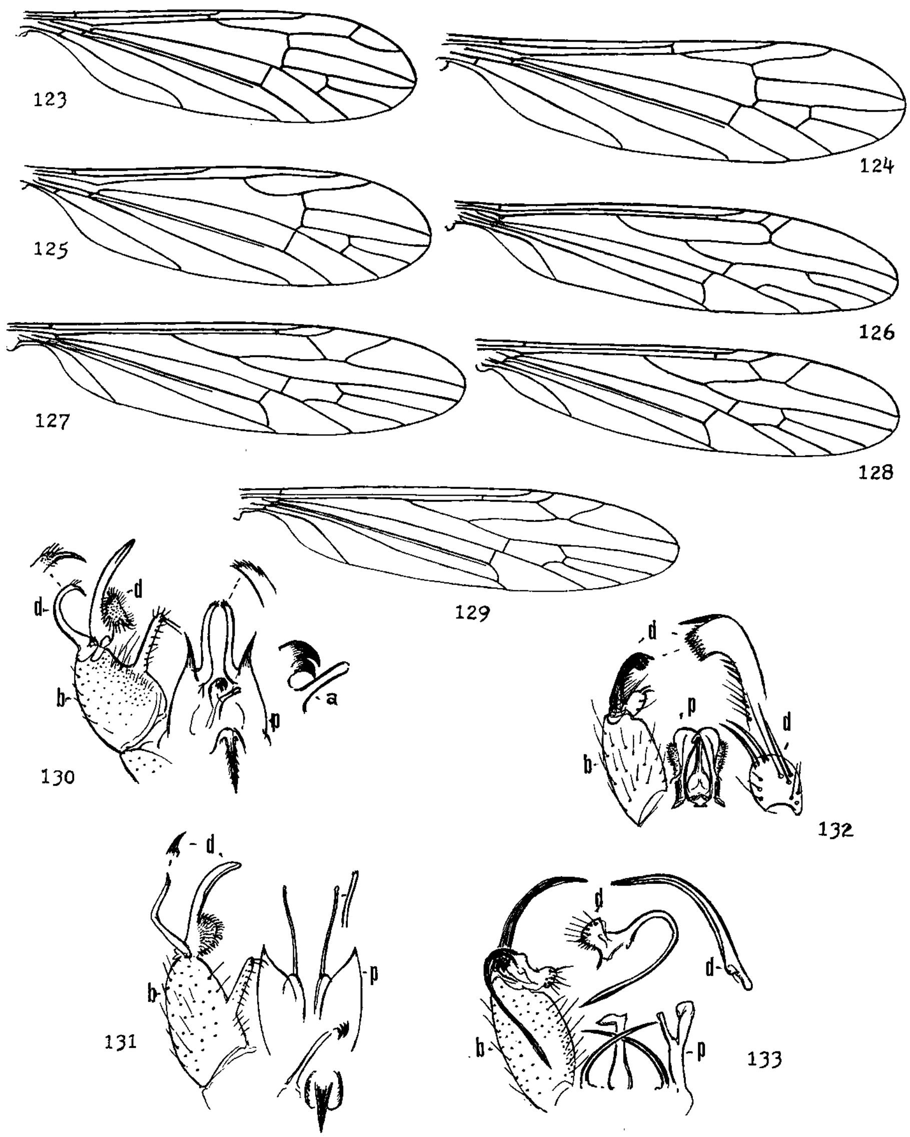

FIGURE 123–133. Genera *Gonomyia* Meigen and *Trentepohlia* Bigot. **123.** *Gonomyia* (*Lipophleps*) *gressittiana* Alexander, n. sp.; venation **124.** *Gonomyia* (*Lipophleps*) *pietatis* Alexander; venation **125.** *Gonomyia* (*Lipophleps*) *yapensis* Alexander, n. sp.; venation **126.** *Trentepohlia* (*Mongoma*) *dybasiana* Alexander, n. sp.; venation **127.** *Trentepohlia* (*Mongoma*) *guamensis* Alexander; venation **128.** *Trentepohlia* (*Mongoma*) *poliocephala* Alexander; venation **129.** *Trentepohlia* (*Mongoma*) *saipanensis* Alexander, n. sp.; venation **130.** *Gonomyia* (*Lipophleps*) *pietatis* Alexander; male hypopygium **131.** *Gonomyia* (*Lipophleps*) *pilifera* (de Meijere); male hypopygium **132.** *Gonomyia* (*Lipophleps*) *secreta* Alexander; male hypopygium **133.** *Gonomyia* (*Lipophleps*) *yapensis* Alexander, n. sp.; male hypopygium (Symbols: *a*, aedeagus; *b*, basistyle; *d*, dististyles; *p*, phallosome).

59. Gonomyia (Lipophleps) esakiella Alexander

Gonomyia (*Lipophleps*) *esakiella* Alexander, 1940, Annot. Zool. Japon., **19:** 216–219, fig. 10 (venation), fig. 20 (male hypopygium).

MALE: Length about 4 mm.; wing 4.5 mm.

FEMALE: Length about 5 mm.; wing 4.5 mm.

General coloration of mesonotum dark gray, thoracic pleura with a very distinct clearly delimited silvery white stripe that is bordered by brown above and by black beneath. Halteres and legs black, femoral bases paler, with a narrow yellow ring at near three-fourths the length, tips of tibiae conspicuously blackened. Wings subhyaline, unpatterned. Male hypopygium with outer dististyle a blackened blade with an acute spine just beyond the basal fourth; inner style terminating in a short black spine; phallosome consisting of two decussate yellow rods that terminate in acute black spines, remainder of phallosome complex.

DISTRIBUTION: Caroline Is. (PONAPE).

PONAPE. Between Kolonia and Nampir (Nampil) Jan. 2, 1938, Esaki (KU); types, 2 males, 2 females.

60. Gonomyia (Lipophleps) gressittiana Alexander, n. sp. (fig. 123)

Allied to *nubeculosa;* size small (wing of female to 3.5 mm.); mesonotal praescutum and scutum light cinnamon brown; rostrum, palpi and antennae black; knobs of halteres weakly infuscated; femora pale brown throughout; wings pale brown, base and costal border pale yellow, apex not whitened, disk with a restricted darker pattern; Sc_1 ending opposite origin of *Rs*, cell R_3 large.

FEMALE: Length about 3.5–3.6 mm.; wing 3–3.5 mm.

Rostrum and palpi black. Antennae black; proximal flagellar segments oval, outer ones elongate; verticils of intermediate segments very long, shorter and weaker on outer segments. Head light brown.

Pronotum and pretergites whitened. Mesonotal praescutum and scutum light cinnamon brown, scutellum pale yellow, postnotum pale brown. Pleura very pale brown with an obscurely whitened longitudinal stripe extending from fore coxae to base of abdomen, passing beneath the halteres. Halteres with stem whitened, knob weakly infuscated. Legs with fore coxae weakly darkened, remaining coxae and trochanters yellow; femora pale brown, without a darkened ring as in other related species; tibiae and tarsi light brown. Wings (fig. 123) pale brown, base, costal border and areas before and beyond the darkened stigma pale yellow; small darkened spots at arculus, origin of *Rs*, and as a vague seam over cord, wing apex not whitened; veins pale brown, darker in the patterned areas. Longitudinal veins beyond cord with long trichia, with fewer on outer ends of *Rs*, *M*, and *2nd A*, more numerous on *1st A*. Venation: Sc_1 immediately beyond origin of *Rs;* cell R_3 present, large, vein R_4 gently arcuated, about two-thirds to three-fourths *Rs;* cell *1st* M_2 widened outwardly; *m-cu* about one-third its length before fork of *M*.

Abdominal tergites dark brown, lateral margins obscure yellow; sternites yellowed. Ovipositor with basal shield buffy; cerci long and slender, gently upcurved.

DISTRIBUTION: Caroline Is. (Yap).

Holotype, female (US 72350), Yap I., Hill behind Yaptown, alt. 50 meters, Dec. 1, 1952, in light trap, Gressitt. Paratopotypes, 5 fragmentary females, Nov. 28—Dec. 2, 1952, Gressitt; 1 female, Mt. Matade (Madaade), alt. 95 meters, Dec. 1, 1952, Gressitt (BISHOP, US).

Gonomyia (*Lipophleps*) *gressittiana* is named in honor of Dr. J. Linsley Gressitt, distinguished student of the Coleoptera and the scientist primarily responsible for the great project covering the *Insects of Micronesia*. The fly is quite distinct from *Gonomyia* (*Lipophleps*) *nubeculosa* (de Meijere) and other allied members of the group, including *G.* (*L.*) *conjugens* Senior-White, of India to Malaya, and *G.* (*L.*) *inquisita* Alexander, of eastern China. Despite the lack of the male sex the coloration of the wings and legs indicates the distinctness of the present fly.

61. Gonomyia (**Lipophleps**) **intrepida** Alexander

Gonomyia (*Lipophleps*) *intrepida* Alexander, 1940, Annot. Zool. Japon., **19:** 219–220, fig. 11 (venation), fig. 21 (male hypopygium).

MALE: Length about 3 mm.; wing 3.4 mm.

FEMALE: Length about 4 mm.; wing 3.5 mm.

General coloration of mesonotum reddish brown, thoracic pleura heavily striped with dark brown and yellowish. Legs brownish black. Wings strongly tinged with brown, stigma slightly darker brown, poorly defined; cell *1st* M_2 small, vein M_{3+4} less than one-half M_4, *m-cu* before fork of *M*. Male hypopygium with outer lobe of basistyle about one-half as long as the single complex dististyle, the latter with two separate fasciculate setae, the outer one from a fingerlike lobe.

DISTRIBUTION: Caroline Is. (Kusaie).

KUSAIE. LELO. Dec. 4, 1937, Esaki (KU), types; 1 male, 2 females: Matanluk, alt. 22 meters, Jan. 24–31, 1953, Gressitt.

62. Gonomyia (**Lipophleps**) **pietatis** Alexander (figs. 124, 130, 131).

Gonomyia (*Lipophleps*) *pietatis* Alexander, 1940, Annot. Zool. Japon., **19:** 220–221, fig. 12 (venation), fig. 22 (male hypopygium).

The present fly is the commonest and most widespread member of the subgenus in Micronesia and because of this is treated in some detail.

Belongs to the *pilifera* group; mesonotum brown, very sparsely pruinose, posterior border of scutellum and basal half of mediotergite more or less brightened, thoracic pleura brown, striped longitudinally with pale. Legs with femora yellow with two brown subterminal rings, the outer one broader. Wings (fig. 124) whitish subhyaline, clouded with pale gray and sparsely patterned with dark brown; *m-cu* before fork of *M*. Abdomen dark brown, posterior borders of segments yellow, more conspicuous on the tergites. Male hypopygium (fig. 130) with basistyle, *b*, stout, not produced into an apical lobe. Three dististyles, *d*, the outer one a strongly curved rod, its apex a short gently curved black spine, with numerous yellow setulae at its base; intermediate style about one-half longer, appearing as a glabrous flattened dusky blade, at base with a subtriangular yellow cushion provided with abundant yellow setulae; inner style retracted, more basal in position, elongate, the two usual fasciculate yellow setae near the tip, remaining setae blackened, placed at apex and along inner margin to base of lobe. Phallosome, *p*, with central organ including a slender black spine provided with appressed setulae, outer blackened hooks paired; gonapophyses with outer apical spine blackened, acute, inner arm relatively broad, in comparison with *pilifera* directed caudad, apex fading into membrane, with relatively few fimbriae. It should be noted that the apparent positions of the two outermost

diststyles may be reversed and it is possible that the style above discussed as being the outer one may represent the actual intermediate or central style. The style described as being the innermost of the three is so interpreted because of the presence of the two usual fasciculate or modified setae, a characteristic feature throughout the subgenus *Lipophleps*. Its position in the present case suggests that it may be an extension or lobe of the basistyle rather than part of the diststyle as construed.

DISTRIBUTION: Micronesia (Mariana, Palau, Caroline, Marshall, and Gilbert Islands).

MARIANA. GUAM: Piti, May 23, 1936, Swezey (BISHOP). SAIPAN: 1.2 miles east of Tanapag, at light, Dec. 9, 1944, April 30, 1945, Dybas (CM).

PALAU. BABELTHUAP: Melekeiok, at light, May 22–23, 1957, Sabrosky (US). KOROR: abundant, July—Oct. 8, 1952, Jan. 1, 1953, Aug. 4, 1953, Beardsley; Southwest, 25 meters, Dec. 11, 1952, Gressitt (BISHOP); Sep. 1952, Krauss (BISHOP). MALAKAL: Sept. 1952, Krauss (BISHOP). PELELIU: north central, July 28, 1945, Dybas (CM); north, May 28, 1957, Sabrosky (US).

ELATO A., ELATO: Feb. 5, 1953, Beardsley; IFALIK A. IFALUK (Ifalik) I., Sept. 25, 1952, Krauss (BISHOP). KAPINGAMARANGI A., WERUA: July 30, 1954, over grassy areas in bread fruit, W. A. Niering (BISHOP, US). KUSAIE: Malem, Dec. 14, 1937, Esaki (KU); Mutunlik, 22 meters, February 6, 1953, Gates Clarke (US). LAMOTRIK A. LAMOTRIK: Feb. 5, 1953, Beardsley (BISHOP, US). PONAPE. Kolonia-Nat, Nov. 19, 1937, Esaki (KU; type). YAP: Giliman, June 12, 1957, Sabrosky (US).

GILBERT IS. BUTARITARI A.: Butaritari I., Dec. 1957, Krauss (BISHOP); Makin, June 11, 1944, J. W. Enke (BISHOP). TARAWA A.: Taborio, Nov. 1957, Krauss (BISHOP).

MARSHALL IS. JALUIT A.: Pinlep I., April 25, 1958, Gressitt; Kili, Oct. 2, 1953, Beardsley (BISHOP, US).

It seems evident that there are several closely related species or perhaps races belonging to the *pilifera* group. In addition to the two discussed herewith, *pilifera* and *pietatis*, the following likewise belong to this group of species. *Gonomyia* (*Lipophleps*) *digitifera* Alexander, Fiji; *G.* (*L.*) *punctigera* Alexander, Tahiti, Australasian; *G.* (*L.*) *ornatipes* (Brunetti), India; *G.* (*L.*) *subpilifera* Alexander, Philippines, Oriental; *G.* (*L.*) *fimbriata* Alexander, Southeast Africa; *G.* (*L.*) *mascarena* Alexander, Reunion I., Ethiopian.

The type species of the group, *G.* (*L.*) *pilifera* (de Meijere), is Oriental. A further brief description and figure of the male hypopygium is provided (fig. 131). Basistyle, *b*, with setae pale but relatively long. Three diststyles, *d*, the outer one a long simple rod, at near two-thirds the length bent at a strong angle, the blackened apical spine very short, near its base with a small flange; intermediate style slightly longer, gently curved, basal cushion with

long yellow setulae; inner style retracted basad to midlength of basistyle, elongate, with paired fasciculate setae near apex. Phallosome, *p*, with outer apical spine of gonapophysis very small, inner arm very slender, almost setoid in appearance, apex exceedingly narrow, pale, with a few pale fimbriae. Central black spine relatively stout, glabrous.

63. Gonomyia (Lipophleps) secreta Alexander (fig. 132)

Gonomyia (*Lipophleps*) *secreta* Alexander, 1931, Philip. J. Sci., **46:** 33–34, plate 1, fig. 20 (venation), plate 3, fig. 40 (male hypopygium).

Size very small (wing of male about 2.5–3.2 mm.); general coloration of body brown, thoracic pleura with a longitudinal light yellow stripe. Antennae brown, basal segments more reddish orange. Halteres with yellow knobs. Legs yellowish brown to brown, without darkened rings. Wings cream yellow to pale brown, costal region light yellow, more evident basally; in type, disk with pale brown washes, darkest at cord, in other regional specimens wings more uniformly darkened except for the yellow costal border, the dark pattern virtually lacking; vein *Sc* ending a short distance before origin of *Rs*. Male hypopygium (fig. 132) with two dististyles, *d*, the outer one a powerful blackened rod, its blunt tip with microscopic spicules, outer angle produced into a spine; inner margin of stem with very numerous setae, the outer ones shorter and more spinoid, outer face of stem polished black; inner style much smaller, pale, very stout, with two fasciculate yellow setae at outer end, remainder of surface with about nine normal setae of various lengths, three on inner margin very long, exceeding the style in length. Phallosome, *p*, with the aedeagus long-oval in outline, darkened, tip decurved; lower phallosomic plate including a broadly depressed-flattened median structure, its apex with a small notch, subtending lateral parts shorter, densely provided with short erect pale setae.

DISTRIBUTION: India, Philippines; Caroline Is. (Palau, Yap).

Type from Ube, Laguna Province, Luzon, in the west known also from Ceylon and India (Mysore).

PALAU IS. BABELTHUAP: Ngaremlengui, June 1–4, 1957, at light, Sabrosky (US); Ngiwal, May 30, 1957, at light, Sabrosky (US).

YAP IS. YAP: behind Yaptown, alt. 50 meters, Dec. 1, 1952, Gressitt (BISHOP).

64. Gonomyia (Lipophleps) yapensis Alexander, n. sp. (fig. 125, 133)

Generally similar to *fijiensis;* size small (wing of male 4 mm. or less); mesonotum chiefly dark brown, pleura light brown with a broad pale yellow longitudinal stripe; legs brown; wings strongly darkened, the cells with paler centers, prearcular field and costal border light yellow; *Sc* short, basal section of vein R_5 long; abdominal tergites dark brown, lateral borders light yellow, hypopygium yellow; two dististyles, terminal in position, very long, blackened; phallosome including widely separated blackened spines.

MALE: Length about 3.6–4 mm.; wing 3.3–3.5 mm.

FEMALE: Length about 4.5–5 mm.; wing 3.8–4.2 mm.

Rostrum and palpi black. Antennae with scape and pedicel yellow, narrowly darkened beneath; proximal three flagellar segments yellow, remainder brownish black; flagellar segments elongate, with very long verticils. Head yellow, center of vertex darkened.

Cervical region, pronotum and pretergites light yellow, the pronotum narrowly darkened medially. Mesonotal praescutum and scutal lobes dark clove brown, lateral borders narrowly

yellow; posterior sclerites of notum somewhat paler brown, pleurotergite, lateral parts of mediotergite and parascutella more yellowed. Pleura light brown, with a broad pale yellow longitudinal stripe extending from and including the fore coxae caudad to base of abdomen, the stripe narrowly bordered both above and below by darker brown. Halteres yellow, base of stem and the knob restrictedly darkened. Legs with coxae yellow, bases narrowly infuscated; trochanters obscure yellow; remainder of legs brown. Wings (fig. 125) strongly darkened, several of the cells with paler centers; cord and outer end of cell *1st* M_2 very narrowly darker brown; prearcular and costal fields narrowly light yellow; veins pale brown, those comprising cord slightly darker, more yellowed in the brightened fields. Longitudinal veins beyond cord with abundant trichia, more basally on *R, Rs, M* excepting the basal fourth, outer end of first section of Cu_1, outer two-thirds of *1st A*, and outer end of *2nd A*. Venation: *Sc* short, Sc_1 ending some distance before origin of *Rs*, the latter strongly arcuated at origin, its branches strongly divergent; basal section of R_5 about three-fourths *r-m;* cell *1st* M_2 widened outwardly; *m-cu* at or before fork of *M*.

Abdominal tergites dark brown, lateral borders broadly light yellow; sternites obscure yellow, sides weakly infuscated, posterior margins narrowly clearer yellow; hypopygium yellow. Ovipositor with basal shield yellow; cerci elongate, outer half curved dorsad to the acute tips. In a paratype from Babelthuap the basal shield is darkened and it is possible that a different species is involved. Male hypopygium (fig. 133) with two terminal dististyles, *d*, both long and slender, blackened, outer style somewhat shorter, appearing as a slightly widened more flattened blade; inner style irregularly dilated at base, thence narrowed into a rod, strongly curved at base, terminating in a long black spine, the dilated base with several setae, none fasciculate. Phallosome, *p*, including a pair of widely separated blackened spines that are decussate at midline, the spines somewhat similar in shape to the outer dististyle and approximately two-thirds as large; inner parts of phallosome pale yellow, lateral apophyses bifurcate outwardly.

DISTRIBUTION: Caroline Is. (Palau, Yap).

Holotype, male (US 72351), Yap I., Weloy, Dugor, June 20, 1957, at light, Sabrosky. Allotopotype, female (US). Paratopotypes, 3 males, 1 female; paratypes, broken, Hill behind Yaptown, December 1–2, 1952, light trap, Gressitt (BISHOP); Melekeiok, Babelthuap I., Palaus, May 22, 1957, Sabrosky (US).

The most similar regional species include *Gonomyia* (*Lipophleps*) *capnitis* Alexander, *G.* (*L.*) *secreta* Alexander, and *G.* (*L.*) *fijiensis* Alexander, which likewise have darkened wings with the costal borders light yellow. All of these species differ among themselves most evidently in hypopygial structure.

Genus **Trentepohlia** Bigot

Trentepohlia Bigot, 1854, Ann. Soc. Ent. France, 3 **2:** 456, 473 (type: *trentepohlii* Bigot).

Old World subgenera:

Trentepohlia Bigot, 1854, as above; Synonym: *Mongomioides* Brunetti, 1911, Rec. Indian Mus., **6:** 296 (type: *trentepohlii* Bigot).

Mongoma Westwood, 1881, Trans. Ent. Soc. London, **1881:** 364 (type: *fragil-*

lima Westwood).

Paramongoma Brunetti, 1911, Rec. Indian Mus., **6:** 295 (type: *albitarsis* Doleschall); Synonym: *Mongomella* Enderlein, 1912, Zool. Jahrb., Syst., **32:** 61 (type: *pallida* Williston).

Plesiomongoma Brunetti, 1918, Rec. Indian Mus., **15:** 314 (type: *venosa* Brunetti).

Anchimongoma Brunetti, 1918, Rec. Indian Mus., **15:** 316 (type: *simplex* Brunetti).

Trentepohlia is a major group of the family, as presently known including nearly 250 species arranged in seven subgenera, of which the five listed above are Old World. Virtually all species are tropical, including all species in the New World and all except about four species in eastern Asia that occur as far north as Honshu, Japan, and Mount Omei, Szechwan, China. In Australasia more than 50 species are known, belonging to four subgenera, *Mongoma*, *Paramongoma*, *Plesiomongoma*, and *Trentepohlia*, but of these only *Mongoma* has been found in Micronesia and is considered in this paper.

The adult flies are slender-bodied delicate insects with unusually long slender legs, in cases with the femora, tibiae and tarsi all greatly lengthened, in some with the tarsi much shorter, only about one-half as long as the tibiae; tibial spurs lacking, claws simple; in various species modified erect setae occur, especially on the femora, either in linear basal rows or more scattered over the length of the segment.

Wing venation (figs. 126–129) showing some peculiar to unique features. Vein *Sc* long, Sc_1 only shortly removed from R_{1+2} at margin. Vein R_2 suberect or directed strongly basad, in cases far before the outer radial fork to beyond (fig. 126) producing a short element R_{2+3}; *Rs* long, commonly in direct longitudinal alignment with vein R_5, the latter extensively fused with vein M_{1+2} to form the anterior border of cell *1st* M_2, thence extended free to the margin shortly beyond the wing tip. Cell *1st* M_2 commonly present, in rare cases (fig. 126) open by atrophy of *m*; Media with either two (M_{1+2} and M_4) or three outer branches (M_{1+2}, M_3 and M_4). Vein Cu_1 commonly fused with *1st A* at outer end, closing cell *Cu*, in several extralimital species the cell narrowly open.

Biology. The immature stages of some Old World species have been found in decaying plant stems. In tropical America various species have been recorded as living in detritus accumulated in water in the axils of bromeliaceous and allied plants (Picado, C., 1912, Bull. Soc. Zool. Paris, **37:** 356–357, figs.).

Concerning the adults, various interesting observations have been made on flies of this genus in relation to spiders that occupy the same habitats. Edwards, 1928, in the Insects of Samoa (Part 6, Diptera, Fasc. 2, Nematocera,

pp. 95–96) has quoted observations made by Buxton in Samoa (Proc. Ent. Soc. London for 1928: 65).

"The remarkable resemblance between some species of *Trentepohlia* and two spiders (*Pholcus ancoralis* and *Smeringopus elongatus*) and also a Reduviid bug (*Gardena*, sp.) has been discussed by Buxton. In Samoa, Tipulidae of the genus *Trentepohlia* are abundant, several species habitually sit in dark places in the forest, for instance between buttress roots; in these places large numbers are found together, covering an area of a square foot or more; these insects, standing close together, sway themselves rapidly and continually on their long legs. The commonest species in Samoa is *T. pacifica* Alexander and one frequently sees a large area of bark the whole surface of which seems to shimmer, owing to the numbers of these insects standing and swaying on it. Occasionally they hang from one another like bees in a swarm...Spiders of the family Pholcidae have the same habit of swaying rapidly as they stand in their webs; frequently a dozen or more stand and do this in a single web, and as the webs are placed in situations similar to those occupied by the *Trentepohlia* some degree of superficial resemblance is achieved. It appears that Pholcidae stand and shimmer in their webs in many parts of the tropics and elsewhere. In Samoa the species which have been observed to do this are *Pholcus ancoralis* and *Smeringopus elongatus;* they are superficially similar and were not distinguished in the field but it seems that both species have the habit. They are dull brown in colour, with long legs, the joints of which are whitish, and the resemblance between them and the *Trentepohlia* was noticed in the field.

"Within Samoa, the *Trentepohlia* and the spiders (collectively) both range from the coast of Upolu to the top of the island, at about 2,000 feet. One may therefore say that they are co-extensive in range, and that they inhabit similar places; also they are similar in colour and in habit, and this makes it difficult to suppose that the resemblance is due to chance alone. It is possible that the resemblance is mimetic; if this view is adopted then presumably the spider is model, the Tipulid mimic, and the Tipulid has used the shimmering habit, common to many Tipulids, and has also copied the spider's pattern and colour. Such a view covers most of the facts, so far as they are known, but it is not easy to see what advantage could accrue to the insect from resembing the spider." For further discussion concerning the possible mimicry above cited, the paper by Edwards should be read for notes and comment on the subject by E. E. Austen.

Under the account of *Trentepohlia* (*Mongoma*) *guamensis* Alexander, later in this paper, the brief comparable observations made by Clarke, Dybas, and Esaki should be noted.

Key to Micronesian Species of Trentepohlia (Mongoma)

1. Wings (fig. 126) with cell M_2 open by atrophy of *m*; vein R_2 beyond the radial fork, leaving a short element R_{2+3}; wings faintly patterned with small brown spots... ....**66. dybasiana**

   Wings (figs. 127–129) with cell *1st* M_2 closed; vein R_2 before the radial fork, leaving a short element R_{3+4}; wings unpatterned except for the stigmal darkening when present, and, in cases, the wing tip faintly clouded, veins pale..........2
2. Size large, wing of male about 9 mm.; wings (fig. 129) yellowed, vein R_3 oblique... ....**69. saipanensis**

   Size smaller, wing of male commonly 5 to 6 mm., rarely to 8 mm..........3
3. General coloration of thorax yellow to orange, legs and wings yellowed (fig. 128), vein R_3 short, suberect, less than one-half R_4..........**68. poliocephala**

   General coloration of thorax light to darker brown, legs more infuscated; wings (fig. 127) with vein R_3 oblique, longer, slightly exceeding one-half R_4..........4
4. Legs, including femora and tibiae, uniformly brown, outer tarsal segments cream colored; wings (fig. 127)..........**67. guamensis**

   Legs brown, tips of femora and tibiae broadly snowy white..........**65. australasiae**

65. Trentepohlia (Mongoma) australasiae Skuse

Trentepohlia australasiae Skuse, 1890, preprint 1889, Proc. Linn. Soc. New South Wales, 2 **4:** 834–835, fig. 17 (wing).

The type, a male, was from the Barron River, North Queensland, collected by Froggatt.

General coloration of body ochreous to light brown. Legs distinctively patterned. Tips of femora abruptly snowy white (about 1 mm.), of tibiae more extensively so (about 2.5 mm.), tibial bases more narrowly pale, remainder brown; basitarsi pale brown, tips and remainder of tarsi creamy white. Femora near base with two elongate modified setae.

DISTRIBUTION: North Queensland; New Guinea, Solomon Islands; Micronesia (Palau Is).

PALAU IS. Koror: Oct. 6, 1952, at light, Beardsley (US).

66. Trentepohlia (Mongoma) dybasiana Alexander, n. sp. (fig. 126)

Size medium (wing about 7–8 mm.); general coloration fulvous yellow, mesonotum vaguely patterned with darker; legs obscure yellow; wings yellowed, with a restricted pale brown pattern, vein R_3 short, oblique, vein R_{2+3} present, cell M_2 open by atrophy of *m*.

Male: Length about 7–9 mm.; wing 7–8 mm.; antennae about 2–2.2 mm.

Female: Length about 9 mm.; wing 7 mm.

Rostrum and palpi fulvous yellow. Antennae fulvous brown, outer segments darker; flagellar segments subcylindrical, exceeding the longest verticils in length. Head dark fulvous brown, the very narrow anterior vertex darker; posterior vertex and ventral surface of head with very long yellow setae.

Cervical region brownish yellow. Pronotum yellow, scutum with coarse erect setae. Mesonotal praescutum yellowed anteriorly and on humeral region, behind with indications of pale brown stripes, the inner edge of lateral pair more evident, crossing the suture onto the scutal lobes; praescutal setae relatively long and conspicuous; median region of scutum and scutellum yellowed, postnotum slightly darker. Pleura fulvous yellow, indistinctly patterned with more yellowed areas. Halteres short, obscure yellow. Legs with coxae and trochanters yellow, apical

1953, Gressitt (BISHOP). TRUK IS. TOL: Mt. Uniböt, 300 meters, Feb. 4, 1953, Gressitt (BISHOP). YAP IS. YAP: Yap Gr., Sep. 1952, Krauss (BISHOP). Kolonia, June 21, 1957, at light, Sabrosky (US).

MARSHALL IS. EBON A.: Ebon I., Sep. 27, 1953, Beardsley (BISHOP).

68. Trentepohlia (Mongoma) poliocephala Alexander (fig. 128)

Trentepohlia (Mongoma) poliocephala Alexander, 1929, Philip. J. Sci., **40:** 266–267, plate 1, fig. 14 (venation); 1940, Annot. Zool. Japon., **19:** 214.

MALE: Length about 4.5–5 mm.; wing 4.8–5 mm.

FEMALE: Length about 5 mm.; wing 5 mm.

General coloration of thorax fulvous yellow, head more grayish yellow. Rostrum and palpi yellow. Antennae with scape and pedicel yellow, flagellum gradually more darkened; flagellar segments long-oval, slightly exceeding the verticils, terminal segment somewhat longer than the penultimate. Anterior vertex about equal in width to diameter of scape.

Halteres yellow. Legs yellow; femora without basal spinoid setae, posterior pair near base with a large erect black seta, fore femora with three less conspicuous more appressed blackened setae. Wings (fig. 128) tinged with yellow, prearcular and costal fields more saturated; veins very light brown, yellowed in costal field. Costal fringe short in both sexes. Venation: *Rs* nearly twice the basal section of R_5; R_{3+4} subequal to R_2 or slightly shorter; vein R_3 suberect.

Abdominal tergites in cases weakly bicolored, narrowly pale brown basally, the much broader apices yellow; sternites and hypopygium yellow, in some specimens the tergites more uniform in color.

Type from Mount Banahao, Luzon, Philippines, collected in May 1928 by McGregor and Rivera.

DISTRIBUTION: Widely distributed in the Pacific Islands, as far south as northern Queensland; Micronesia (Caroline Islands).

PALAU IS. BABELTHUAP: East Ngatpang, alt. 85 meters, March 10, 1952, Gressitt (BISHOP); Ulimang, Dec. 16, 1947, Dybas (CM). KOROR: April 27, 1957, at light, Sabrosky (US).

FAIS I. October 5, 1952, Krauss. PONAPE I. KOLONIA: Jan. 17, 1938, Esaki (KU); Nanpil, Nett District, Feb. 27, 1948, Dybas (CM); Mount Kupuriso, alt. 1000–1500 feet, March 11, 1948, Dybas (CM); Mount Tamatamansakir, alt. 180 meters, Jan. 17, 1953, Gressitt. TRUK IS. Mt. Unibröt, Tol I., 370 meters, Dec. 31, 1952—Jan. 2, 1953, in lower native forest, Gressitt (BISHOP). UTAGAL I., Woleai, A., Sep. 20, 1952 (Krauss). YAP IS. YAP: Kolonia, June 13—21, 1957, at light, Sabrosky (US). Mount Gillifitz (now Mount Tabiwol), alt. 160 meters, Nov. 29, 1952, Gressitt.

69. Trentepohlia (Mongoma) saipanensis Alexander, n. sp. (fig. 129)

Size large (wing of male about 9 mm.); thorax above almost uniformly light orange yellow, pleura clearer yellow; halteres and legs yellow, the latter with spinoid setae on fore and hind femora; wings pale brownish yellow, veins slightly darker yellow, vein R_2 some distance before radial fork, cell R_2 at margin nearly two-thirds cell R_3; abdominal tergites and hypopygium medium brown, basal sternites yellow.

MALE: Length about 9.5 mm.; wing 9 mm.; antenna about 2.2 mm.

Rostrum fulvous, labial palpi light yellow, maxillary palpi light brown. Antennae yel-

lowish brown, scape slightly darker; flagellar segments subcylindrical, longer than the vestiture, intermediate segments from about two and one-half to three times as long as their diameter, terminal segment about one-fourth longer than the penultimate. Head medium brown; vestiture very long and conspicuous, yellow.

Pronotum brownish yellow, sides clearer yellow. Mesonotum almost uniformly light orange yellow, pleura somewhat clearer yellow; setae of praescutal interspaces pale, erect, on scutellum and mediotergite vestiture darker, very abundant. Halteres yellow. Legs with coxae and trochanters yellow, remainder of legs appearing slightly darker because of the vestiture; bases of femora with microscopic spinoid setae, the outer ones larger, on posterior legs the row of spines interrupted, including two basal and three outer ones, on fore femora the row more continuous but with the more proximal spines very small, middle femora apparently lacking such spinoid setae. Wings (fig. 129) pale brownish yellow, veins only slightly darker yellow, poorly visible in balsam slide mounts. Wing base in prearcular field with two separate groups of very long setae, the more basal ones shorter and blacker, submarginal in position. Trichia on veins R and distal section of R_5, with fewer on the combined vein R_{4+5} and M_{1+2}. Venation: R_2 some distance before radial fork, vein R_{3+4} about one-third R_2, cell R_2 at margin nearly two-thirds cell R_3; base of cell M_3 slightly retracted; apical fusion of veins Cu_1 and *1st A* about one-half as long as the last section of Cu_1.

DISTRIBUTION: Mariana Islands.

Holotype, male, Saipan I., 1.2 miles east of Tanapag, May 7, 1945, H. S. Ducoff, through Dybas (FM).

The most similar regional species is *Trentepohlia* (*Mongoma*) *spectralis* Edwards, of Samoa, which has the body and wings entirely pale yellow, including the veins. As stated by Edwards, in this latter fly the spinoid setae of the femora are lacking, being replaced by slender modified setae that extend over virtually the whole length of the segment. Additional to the much paler yellow color of the wings and veins, there are slight differences in venation, including the nearly equal veins R_2 and R_{3+4} in *spectralis*.

BIBLIOGRAPHY

ALEXANDER, C. P.

1915. New exotic Tipulidae (Diptera). Canad. Ent., **47:** 79–83, 5 figs.

1920. The crane-flies of New York. Part II. Biology and phylogeny. Cornell University, Agricultural Experiment Station, Memoir **38:** 691–1133, pls. 11–97 with 539 figs.

1927a. The interpretation of the radial field of the wing in the Nematocerous Diptera, with special reference to the Tipulidae. Proc. Linn. Soc. New South Wales, **52:** 42–72, 92 figs.

1927b. The Oriental Tipulidae in the collection of the Indian Museum. Part I. Rec. Indian Mus., **29:** 167–224, 1 pl., 23 figs.

1929a. New or little-known Tipulidae from the Philippines (Diptera). V. Philip. J. Sci., **40:** 239–273, 1 pl. with 18 figs.

1929b. A comparison of the systems of nomenclature that have been applied to the radial field of the wing in the Diptera. IV. Internat. Congress Ent., **2:** 700–707, 3 pls.

1934a. New or little-known Tipulidae from Eastern Asia (Diptera), XXI. Philip. J. Sci., **55:** 19–60, 3 pls. with 41 figs. (male hypopygium in *Limonia*).

1934b. *In* C. H. Curran, The families and genera of North American Diptera, references pp. 38–39, pl. 1 figs. 1–10. (venation of radial field of wing).

1936. New or little-known Tipulidae from Eastern Asia (Diptera), XXXII. Philip. J. Sci., **61:** 113–149, 2 pls. with 36 figs. (venation of *Limonia: Gressittomyia*, fig. 4).

1940. Tipulidae from the Japanese Mandated South Sea Islands (Diptera). *In* Results of Professor T. Esaki's Micronesia Expeditions 1936–1940, No. 44. Annot. Zool. Japon., **19:** 198–221, 22 figs.

1942. Tipulidae of Guam. *In* Insects of Guam—I. Bull. B. P. Bishop Mus., **172:** 195–198, 1 fig.

1950. Notes on the tropical American species of Tipulidae (Diptera), VI. The tribe Limoniini, genus *Limonia;* subgenera *Limonia*, *Neolimnobia*, *Discobola*, and *Rhipidia*. Rev. Ent., **21:** 161–221, 42 figs.

1956. New or little-known Tipulidae (Diptera), CI. Oriental-Australasian species. Ann. Mag. Nat. Hist., ser. 12, **9:** 145–163. (venation of *Limonia: Degeneromyia*).

1964. New or little-known Tipulidae from Eastern Asia (Diptera), LV. Philip. J. Sci., **93:** 427–478, 5 pls. with 54 figs. (detailed discussion of *Limonia* and list of subgenera).

1967. Notes on the tropical American species of Tipulidae (Diptera), VII. The tribe Limoniini, genus *Limonia*, concluded: *Helius*, *Orimarga* and others; tribe Pediciini; subfamily Cylindrotominae. Studia Ent., **10:** 277–352, 78 figs.

Alexander, Charles P. and Mabel M.

1970. A catalogue of the Diptera of the Americas south of the United States (Sao Paulo, Brazil), pp. 1–259. (Records 3088 species; *Limonia* 598 species).

Cheesman, Evelyn

1932. Hunting insects in the South Seas, pp. 1–243, 8 pls. (Philip Allan & Co., London).

Clarke, J. F. Gates

1971. The Lepidoptera of Rapa Island. Smithsonian Contributions to Zoology, No. **56:** 1–282, 29 pls., 175 figs.

Edwards, F. W.

1912. The Percy Sladen Trust Expedition to the Indian Ocean in 1905, vol. 4, No. 14—Diptera, Tipulidae. Trans. Linn. Soc. London, Zool., **15:** 195–214,2 pls., 30 figs.

1938. British short-palped craneflies. Taxonomy of adults. Trans. Soc. British Ent., **5:** 1–168, 31 text figs., 5 pls. with 103 figs. (wings).

Gressitt, J. Linsley

1954. Insects of Micronesia, volume 1, Introduction, pp. 1–257, map, 70 figs.

Hardy, D. Elmo

1960. Insects of Hawaii, 10, Diptera: Nematocera-Brachycera, pp. 1–368, 120 figs. (with subfigs.).

Meijere de, J. C. H.

1911. Studien über südostasiatische Dipteren, V. Ostindische Tipulidae. Tijdschr. Ent., **54:** 21–79, 4 pls. with 49 figs.

Stone, Benjamin C.

1971. America's Asiatic Flora: The Plants of Guam. American Scientist, **59:** 308–319, 15 figs. (color).

Swezey, O. H.

1915. A leaf-mining cranefly in Hawaii. Proc. Hawaiian Ent. Soc., **3:** 87–89.

Tokunaga, Masaaki

1940. Revision of marine craneflies (Tipulidae), with descriptions of some species. Kontyû, **14:** 133–148, 18 figs.

VANE-WRIGHT, R. I.

1967. A re-assessment of the genera *Holorusia* Loew (=*Ctenacroscelis* Enderlein), *Ischnotoma* Skuse and *Zelandotipula* Alexander (Diptera: Tipulidae), with notes on their phylogeny and zoogeography. Jour. nat. History, **1:** 511–547, 46 figs.

WILLIAMS, F. X.

1943. Biological studies in Hawaiian water-loving insects. Part III. Diptera or flies. C—Tipulidae and Psychodidae. Proc. Hawaiian Ent. Soc., **11:** 313–338, 8 figs., 6 pls. with 42 figs.